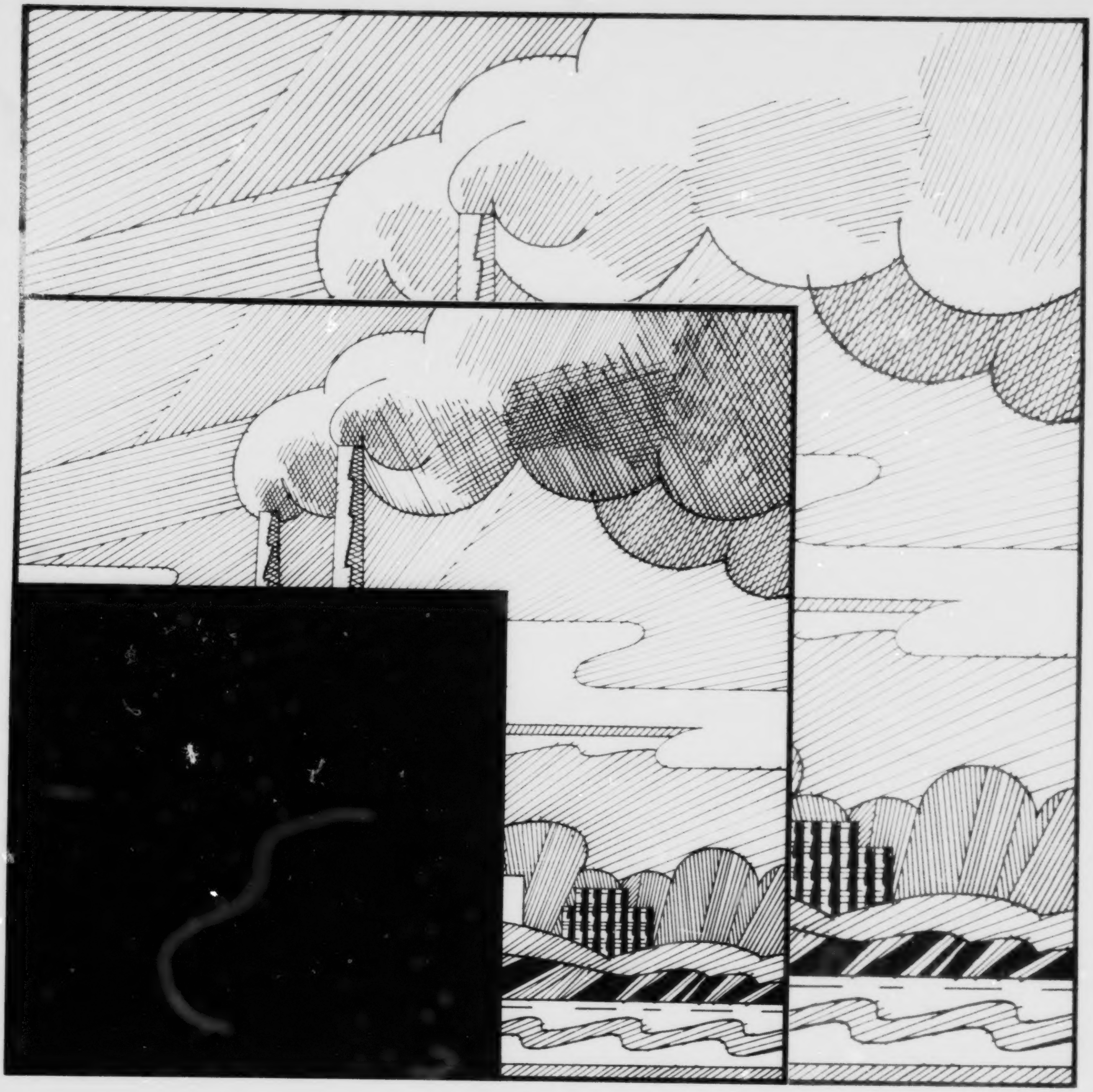

37th
Ontario
Waste
Management
Conference

June 10 -13
1990
The Prince Hotel,
Toronto, Ontario

Proceedings

Environment
Ontario

Proceedings
# of the
Thirty-seventh
Ontario Waste Management Conference

held at

The Prince Hotel
Toronto, Ontario

June 10-13, 1990

Sponsored by the
Ontario Ministry of the Environment

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PREFACE TO THE PROCEEDINGS OF THE 37th Ontario Waste Management Conference

On behalf of the Ontario Ministry of the Environment, and the Conference Planning and Program Committees, our thanks and appreciation to those who registered for the annual Ontario Waste Management Conference. The attendance at the 37th session was 410.

The general consensus of those attending the Conference was that the format introduced last year, more papers and longer sessions, was again successful. The authors and the session moderators contributed significantly to this success, along with the efforts of the members of the Planning and Program Committees as well as the representatives from the Pollution Control Association of Ontario and the Air and Waste Management Association. The combination of these ingredients all factored into the staging and maintaining the high credibility of this Conference.

A breakdown of the delegate representation at the Conference reflects its diversity of interest. Provincial governments delegates comprised 16.4% of attendees; federal government 1.1%; municipal governments 12.3%; government agencies 8.0%; consultants 15.8%; industry 40.1%; academic 0.8%; and media 5.5%. With such a cross-section of environmental interest, those attending the Conference could not help but benefit from the information and ideas exchanged.

The papers incorporated in these Proceedings are those presented at the 37th Conference. It is the permanent record of the deliberations presented and discussed. Share it with your associates and plan again on attending the 38th Ontario Waste Management Conference which will be held in Toronto, June 16 to 19, 1991, at The Prince Hotel.

Boris Boyko
Chairman

ONTARIO WASTE MANAGEMENT COFERENCE
HISTORICAL DATA

Location	Dates	Sponsor
Ontario Agriculture College, Guelph	1954 to 1956	Pollution Control Board of Ontario
Delawana Inn. Honey Harbour	1957 to 1963	Ontario Water Resources Commission, Water & Pollution Advisory Committee
Bigwin Inn, Lake of Bays	1964 & 1965	Ontario Water Resources Commission, Water & Pollution Advisory Committee
Park Motor Hotel, Niagara Falls	1966 & 1967	Ontario Water Resources Commission
Sheration Brock Hotel, Niagara Falls	1968 to 1971	Ontario Water Resources Commission
Skyline Hotel Toronto	1972 to 1974	Ontario Ministry of the Environment
The Prince Hotel, Toronto	1975 to 1990	Ontario Ministry of the Environment

Conference Chairman	Dates	Secretary/ Co-Ordinator
Dr. A.E. Berry	1954 to 1962	D.S. Caverly/M. Grove
D.S. Caverly	1963 to 1973	L.M. Tobias
K.H. Sharpe	1974 to 1976	M.J. Cathcart (1974)
D.P. Caplice	1977 & 1978	
	1975 to 1990	M.F. Cheetham
J.W. Giles	1979 to 1986	
R. M. Gotts	1987	
B.I. Boyko	1988 to 1990	

Program Conveners

1954-1958	A.V. DeLaporte
1960-1973	F. A. Voege
1974-1978	J.B. Patterson
1979-1990	R.C. Stewart

1991 - 38th ONTARIO WASTE MANAGEMENT CONFERENCE
THE PRINCE HOTEL, TORONTO, ONTARIO
JUNE 16 - 19

CONFERENCE PLANNING COMMITTEE

Conference Chairman
B.I. Boyko,
Director,
West Central Region,
Ontario Ministry of the
Environment

Conference Vice-Chairman
H.M Wong,
Director,
Waste Management Branch,
Ontario Ministry of the
Environment

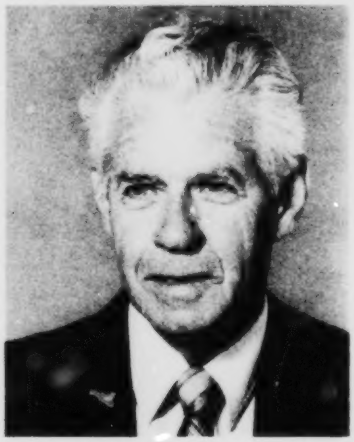
Program Convener
R.C. Stewart,
Manager Technical Support
West Central Region,
Ontario Ministry of the
Environment

Conference Co-Ordinator
M.F. Cheetham,
Ontario Ministry of the
Environment

Branch Liaison
M.B. Fielding,
Co-Ordinator, Technology
Transfer, Waste Management
Branch, Ontario Ministry
of the Environment

TECHNICAL PROGRAM COMMITTEE

C.E. Duncan (ret), Former Coordinator
Niagara River Improvement
Program, Environment Ontario
Hamilton


F.N. Durham Manager,
Abatement South
Southwestern Region,
Environment Ontario, London

P. Isles, Manager,
Abatement West, Central
Region, Environment Ontario

G. Rocoski, Manager, Waste
Management Policy Section,
Waste Managemnt Branch,
Environment Ontario

M.Greenfield
Dofasco, Hamilton
for Pollution Control Association of
Ontario

J. Zend, Manager, Emission
Technology & Regulation
Development Section, Air
Resources Branch, Environment
Ontario

S.Toplack, Region of Niagara
Works Dept., Thorold, Ontario
for Air and Waste Management
Association

THE PAPERS AND THE AUTHORS

at the

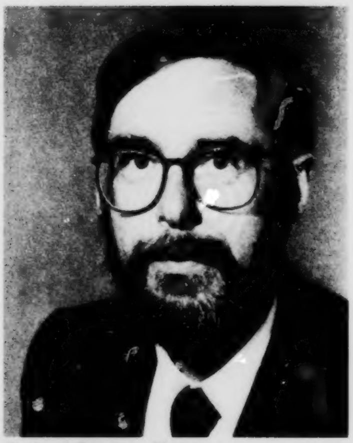
37th ONTARIO WASTE MANAGEMENT CONFERENCE

JUNE 1990

TORONTO, ONTARIO

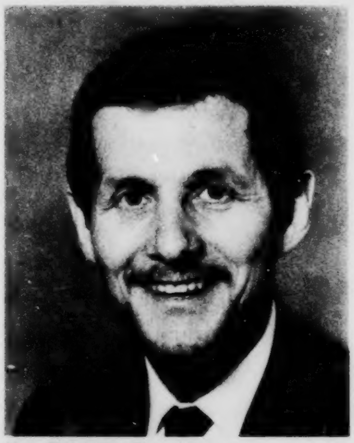
SESSION I — ENVIRONMENTAL OVERVIEW

Moderator: Gary S. Posen
Deputy Minister
Environment Ontario, Toronto



Richard Findlay, Director,
Ontario Roundtable
on Environment and Economy, Toronto

Keith West, Project Member,
EA Task Force
Environment Ontario, Toronto



Ken Rchards, Coordinator,
Intergovernmental
Relations Office, Environment Ontario,
Toronto

T. Armstrong, Asst. Director
Environment Ontario Approvals Branch
Toronto

MINISTERIAL UPDATE AND CHALLENGE'S OF THE 90'S

BY

GARY S. POSEN

DEPUTY MINISTER

ON BEHALF OF

THE HONOURABLE JIM BRADLEY

ONTARIO MINISTER OF THE ENVIRONMENT

It is a pleasure to speak to you on behalf of the Honourable Jim Bradley, Ontario's Minister of the Environment, who is unable to be here today. Jim is recovering from eye surgery and hopes to be back in action in about 10 days.

I think you will agree that both the necessity and timeliness of this forum increase each year. Waste management in Ontario -- indeed in our country, on the continent and in the world -- has become a pressing public policy issue. Quite simply, the waste we generate, how we dispose of it, and the effects of disposal practices on our economy and environment, affects every one of us in a very direct way.

This morning I would like to share this thought with you: In order to reduce and better manage the waste we generate, all levels of society -- government, industry, and citizens -- must assume collective responsibility for our waste products.

What is required to achieve this is nothing less than a re-thinking of the way we create and dispose of waste.

As you know, the Ontario Ministry of the Environment has strongly promoted sound waste management practices. Programs such as Blue Box municipal recycling, the implementation of the 3Rs, and support for home compost projects, among others, have made an important start in reducing the waste we generate. Of equal importance, these programs have moved many Ontarians to ponder the crucial issue of waste reduction and disposal.

Before bringing you up to date on specific ministry programs and their results, let me review briefly the waste situation in Ontario.

Our growing population and economy produce ever-increasing quantities of waste. In 1987, for example, Ontario generated approximately ten million tonnes of waste, more than one tonne for every person. Almost half of our non-hazardous solid waste comes from private residences. The remainder is created by industrial and commercial activity.

In urban areas, waste volumes are growing at an especially rapid rate. In some areas, the per capita volume of waste has increased by 25 per cent over the past decade. this growth rate has clogged the capacities of many landfill sites, especially in Metro Toronto and environs.

So, while we have been generating ever-increasing amounts of waste, we have not been enlarging our waste disposal capacity at the same rate. At present, we are in a situation where we continue to rely heavily on landfills, yet many of these facilities are quickly filling up.

However, establishing new landfills is not, by itself, the solution to our waste problem. Landfill leachate can contaminate surface and groundwaters, resulting in human health risks and environmental damage. Consequently landfills require monitoring, post-closure care and, sometimes, long-term cleanup.

Quite simply, the issues of accelerated waste growth, limited disposal capacity, deficiencies in some disposal facilities, and planning and approval complexities are challenging our ability to deal with waste.

The good news is that in the face of these challenges, we are making progress in our efforts to promote sustainable waste management practices in Ontario. Metropolitan Toronto reports that "in 1989, for the first time in the history of Metro, the amount of waste going to disposal was less than the year before. In fact, it was less than two years ago."

This is particularly significant because Metro currently generates more than one third of the province's municipal solid waste.

Our diversion program has also begun to show positive results. The cumulative total of all waste diverted by the 3Rs programs in Ontario since 1986 amounts to more than 1.25 million tonnes.

We are on the right track both in reducing and in diverting from landfill and incineration, some of the waste we generate -- yet it is only a start. More needs to be done. Industry and municipalities must involve themselves in this process in new and effective ways.

This past March, Mr. Bradley endorsed the National Packaging Protocol, which calls for a 50 per cent reduction, from 1988 levels, in the quantity of packaging sent for disposal by the year 2000.

The protocol is a national program which recommends packaging policies for Canada and target dates for achieving diversion levels. The provinces, together with the federal government, are co-operating in this endeavour. The protocol deals with industrial, commercial, and household packaging, and was developed in consultation with the territorial and municipal levels of government, industry, environmental and consumer groups.

Six important policies to reduce packaging waste in Canada are set forth in the protocol. Using these policies as guiding principles, the federal and provincial governments -- with the participation of concerned groups -- will enact standardized packaging regulations in Canada.

Of special significance is the policy which gives priority to the management of packaging through source reduction, reuse and recycling -- the 3Rs. A "Code of Preferred Canadian Packaging Practices" will be created to guide industry in the design of products and in the selection and design of packaging.

In developing this code, we will consider the following hierarchy of measures:

i) no packaging;
ii) minimal packaging;
iii) reusable packaging; and
iv) recyclable packaging and packaging containing recycled material.

The federal government will be developing, in consultation with interested parties, national minimum content standards for the inclusion of recycled material in packaging. The standards will take into account health, safety, packaging product performance requirements, and regional limitations.

The success of these measures will require the participation and co-operation of industry. What is needed is a collective commitment to meet the targets of the protocol.

By the end of this year, the federal government and the provinces will have a data base to measure the amount of packaging generated in Canada. The information collected will be used to develop national packaging regulations, and to monitor progress towards meeting the targets outlined in the protocol.

Industry is not the only group that is being asked to rethink the way it generates and disposes of waste. In Ontario, the provincial government has moved to reform waste management practices in the operations of the Ontario Public Service.

The government is promoting waste reduction, conservation, and the development of environmentally beneficial products and industries.

We are putting our own house in order, even as we ask you to do the same.

It is now Ontario Government policy to purchase supplies, equipment and services the use and disposal of which will cause minimal impact on the the environment. The Government is giving special consideration to suppliers of such products.

New selection criteria for the purchase of supplies, equipment and services incorporate a 3Rs approach and require that:

- waste by-products be minimized;
- there be a maximum reuse potential for purchased goods;
- there be maximum recycling potential for goods that cannot be reused; and

- waste products be degradable to environmentally benign substances.

In order to help our suppliers, the government is establishing mandatory standards for designated products which contain specified levels of recycled content from post-consumer waste.

Government, along with industry and consumers, must develop new and effective ways of reducing waste. The use of energy-saving light bulbs, water-conserving showerheads and toilets, recycled fine papers, retreaded tires, and re-refined lubricating oil -- to name but a few products -- should conserve resources and save energy expended on the production of new goods.

The Ministry of Government Services has already spent $6.9 million solely for the purchase of fine papers containing recycled content.

There is no going back to the old, wasteful practices of our society, where products were consumed and discarded with little heed paid to the finite supply of many raw materials, or the harmful environmental consequences of disposal.

In the area of municipal recycling, the ministry's internationally recognized Blue Box program will continue to grow. Last month, Mr. Bradley announced that two million Ontario households were participating in the province's recycling program.

We project that by the end of 1990, Ontario's Blue Box program, including apartment service and rural depots, will be diverting more than 315,000 tonnes of economically useful materials from landfill. Blue Box communities are now diverting approximately 14 per cent of their household waste.

Building on the success and scope of the Blue Box program, the ministry is funding the distribution of backyard composters to households. At the same time, we are encouraging municipalities to set up centralized compost facilities. I am pleased to note that the Region of Peel has begun a demonstration project that examines options for a variety of compost collection systems. Such systems could potentially serve central compost facilities, which would increase significantly the amount of household waste recycled.

We have funded some 120,000 backyard composters in 45 communities. This aspect of our 3Rs program is just getting underway and has great potential, as is evidenced by the fact that about one-third of all household waste consists of compostable kitchen scraps and garden clippings.

There is still much work to do to achieve the government's goal of diverting 25 per cent of all waste to productive uses by 1992, and a full 50 per cent by the year 2000.

To reach this goal, we are committed to expanding the 3Rs in Ontario. In this fiscal year, we have boosted our funding for recycling by 90 per cent.

Our funding increased from 20 million dollars to 38.5 million dollars to help pay for promising new industrial waste reduction, reuse and recycling projects; the development of markets for recycled materials; an expansion of school recycling programs; an extension of Blue Box curbside recycling to new communities; and the addition of plastics and compost to the household recycling stream.

Our waste management efforts have begun to pay off. More than 300 Ontario municipalities have taken advantage of the financial aid for recycling available from the ministry and OMMRI, a private sector corporation created to support the 3Rs.

We have estimated the government share of achieving 50 per cent diversion from disposal at 225 million dollars. We are looking to our partners in recycling to achieve even more and we are expanding the base of that partnership.

The grocery industry, and its suppliers and packagers, and newspaper publishers and the newsprint industry, have joined with the soft drink industry in creating the second phase of OMMRI.

OMMRI has committed to a total of 45 million dollars over the next five years to help meet provincial waste management goals.

OMMRI is pledged to:

- Expand the scope of recycling programs, by adding more plastics, corrugated cardboard, boxboard, mixed papers and other materials to the list of recyclables collected.

- Support composting research and implementation.

- Fund market development for recycled products, and support recycling research and technology development.

- Upgrade and expand facilities for handling and processing recyclable materials, and

- Encourage commercial and institutional recycling.

Moreover, OMMRI member companies will be changing their purchasing practices to encourage the use of recycled content, promoting internal recycling, and minimizing the weight and volume of materials used in products and packaging.

OMMRI is by no means yet fully developed. We will next be expanding this recycling fraternity to include retail food industry products, the general merchandise area including the major department store chains, retail pharmaceuticals and the fast food sector.

As you can see, the government is determined to achieve the waste diversion targets it has set. In the very near future, we will make public new proposals on how all sectors of our society can further contribute to managing their waste.

The ministry will be asking you to comment on these ideas, and to tell us what you think should be done to reach Ontario's waste diversion goals.

The challenge of reducing and diverting to productive uses the waste we generate -- as private or corporate citizens -- is a collective one. It will require a collective effort and bold measures if we are to succeed; and succeed we must.

For the cost of failure to manage our own waste would be far too high.

AN OVERVIEW OF THE PREMIER'S ROUNDTABLE

by
Richard A. Findlay, Director, Ontario
Round Table on Environment and Economy
Toronto, Ontario

Good Morning, Ladies and Gentlemen. My son, Peter, is 9 years old. My daughter, Heather is 12. Rather than giving you feedback on the state of our environment and how we all are working so hard to fix it. Rather than give you feedback, I want to give you feed forward. To imagine and describe a sustainable society. A society in which Peter and Heather will live, say in the year 2030. When Heather and Peter will be adults among other adults, who might be meeting in conferences like this. To talk about pressing issues of the day, as we are talking about the protection of our environment.

But the pressing issue which I submit is the real issue we face is one of sustainability. Making sure that our society is one that satisfies its needs without jeopardizing the prospects of future generations.

The way that we achieve this sustainable society - the society of the future - is by following a set of principles which people are now commonly calling sustainable development.

I want to describe a vision of Heather's and Peter's world to you. I want to convince you that the future will be exciting - but above all possible. Because I believe that the future is shaped by people who believe in the future.

Then I want to tell you how the Ontario Round

Table on Environment and Economy is working to design an agenda for achieving a sustainable future.

Finally, I want to convince you that you can make a difference. You *must* make a difference. Because achieving sustainable development is not the job of the Ontario Government. Achieving sustainable development is not the job of industry. Sustainable development is not *my* job. It is *our* job. A sustainable society - a sustainable future - will never be achieved unless we all believe it can happen - and believe that we can make it happen. It will only happen if everyone wants it to.

Impossible you say? Well look at the

change in Eastern Europe recently. Who would have believed it - only a couple of years ago? Look at the universal concern about our environment these days. It's number one or two on the hit parade of our pollsters in survey after survey.

Oh sure, you say. Just look at the front page story in the Globe last week. Nobody really cares. And sure, you say - just wait for the next recession. Well, I will await the next recession with keen interest and a kind of curiosity. Because I'll bet that people might view the next recession as a period of economic insecurity - as a symptom of the problems we face with the current situation of environmental insecurity.

The connections are being made. Can you be a fisherman without fish, a logger without trees, a farmer without good soil? Dreaming in technicolour you say? Well I don't think so. Somebody once said I could probably be a pessimist but it would never work! I prefer to believe that the idea of developing sustainably is just good common sense.

I believe, actually, that the concepts of sustainable development have been suppressed in the human psyche for a long time. And perhaps it is these beliefs that lead to my optimism about the future. My optimism that we will be able to unlock this suppressed but latent instinct for survival that we hold.

So what will Heather's and Peter's world look like in 2030? I want to acknowledge and borrow an article called Picturing a Sustainable Society by Lester Brown of the Worldwatch Institute, found in the 1990 State of the World report. Something I encourage anyone who wants to understand sustainable development to read. I'm sure many of you have already. It describes a world, that to me, makes the term sustainable development come alive. Lester Brown makes the case that we must achieve sustainability by 2030, if we are going to do so at all.

I join with those who believe that the 1990's will be the turn-around decade. The decade in which we must chart the new course. Otherwise, continued economic and environmental deterioration and decline will feed on each other and drag us rapidly into a downward spiral of social disintegration. Well how will we do it? I believe the answers to the question are all about us. Rather like the fellow in Mark Twain who was amazed to find that he had been speaking prose all of his life and didn't know it.

How will we do it? New technologies will help.

* Automobiles will get at least 100 miles per gallon - a car built by Toyota can do that right now.

* New lighting systems will be in use. We will have to go to the ROM or the Science Centre to see a traditional incandescent light bulb.

* Compact fluorescent fixtures available on the market right now use 20% of the energy of an ordinary bulb - and last virtually forever.

* Amazing improvements in electric motor design already available will make appliances several times as efficient as today.

* Cogeneration of heat and power will be the norm.

* Waste heat from industrial processes and power plants will be used to raise total plant efficiencies into the 90% range.

* Transportation systems will be reshaped with much more diverse options available.

* Only electric or hydrogen powered vehicles will be allowed in downtown areas of cities.

* Bicycles and bike paths will make cycling easy and pleasant and safe.

* More people will work at home or in satellite offices near home.

* Moving electrons around will be a lot more sustainable than moving people.

* We will have realized that we are choking ourselves in our own garbage.

* The 3 R's will be preeceded by an "A" for avoid. We will avoid using and consuming. Then we will reduce, reuse and recycle. And maybe we will recover the energy content of what's left. There probably won't be much. Disposal will be a long way down the list; even within the 3 R stages there will be a hierarchy of activities.

* And composting, will of course, be king. We will recycle nutrients in doing so.

* Agriculture will be sustainable - it will have to be because our population will stabilize at well below 9 billion many predict - we are at 5 billion now.

* We will need sustainable agriculture because, says Lester Brown, with 960 billion fewer tons of topsoil in the world (more than twice the amount of all U.S. cropland) how else can we feed those 3 or 4 billion more people? That's of current rates of soil erosion continue unaltered for the next 40 years.

* Farms will be much more diversified.

* People will learn to enjoy eating lower down on the food chain.

* Mono culture farming will move to polyculture and practises of repeated tilling will change.

* Forests and woodlands will be very important in achieving sustainability.

* Timber management will be intensive rather than extensive.

* Communities that have a stake in their forests will have a much greater influence in the control of crown lands.

* A forest will be recognized as being much more than the trees.

* Our energy systems will be powered by the sun.

* Our reliance on fossil fuels will be a greatly reduced fraction of what it is today with a greater use of active and passive solar collectors,

photovoltaics, wind farms, small scale hydro, bioenergy, fuel cells and improved insulating materials.

I mention all these technologies because they are known and can be used right now. I also have faith that technologies undreamed of now will be taking us even farther.

Our economy will be more equitable and secure. A big reason for this will be that government will learn that environmental security is actually a greater threat to mankind than military security. And investment will shift accordingly.

The GNP as an indicator of economic

prosperity will still be around but it won't mean much. People will also watch the SNP - yet to be developed - a sustainable net product indicator.

So all of this is just a quick sketch of a sustainable society. Heather's and Peter's world. Will we achieve it? Well, we will do it because we must do it. But more importantly we will want to create a society much different and actually preferable to today's. People will want to see and live in an exciting new, more secure, equitable and healthy society. They will also be driven to want to do so because they will be horrified by the prospects of not doing so. There are limits.

Yes, growth will continue to happen as we continue on this path of developing a sustainable society. Growth will be inevitable. Our challenge will be to grow wisely, while respecting and growing within the carrying capacity of our environment. This is the challenge of sustainable development. Now I want to describe for you the challenge of the Ontario Round Table.

Let me say, first, that the members of the Ontario Round Table have not found their task to be easy. You have not heard too much about the Round Table over the last year, because the Round Table has been wrestling with the ideas we have been talking about. It is tough. And finding a unified message for the Round Table to deliver has been very difficult. But the Round Table has decided on a direction to take, and is developing a road map to chart the journey.

Many of you may know something about the Ontario Round Table. Chaired by Murray Elston, Chairman of the Management Board of Cabinet, it reports to the Premier and is composed of 6 CEO's, a Mayor, labour leader, native leader, academia, 6 Cabinet Ministers and members of environmental organizations.

The priority activity of the Round Table is to oversee the production of a provincial strategy to achieve sustainable development. The process we will employ will be open and consultative and will serve as an educational tool for those both directly and indirectly involved with the strategy's preparation.

At present, we are finalizing the first of two Challenge Papers which will serve to seed the public debate on what our strategy should aim to achieve and over what time frame. This Challenge Paper will be a tool, amongst others, for indicating the directions the Round Table believes we must follow. These directions for change, together with a set of milestones and targets, will help us answer the question of how to implement a sustainable future. Together, they will constitute an indicative agenda for Ontario to follow as we pursue the development of our strategy. Ontario's strategy.

The Round Table has identified 6 principles which will help define sustainable development and which provide the foundation for our strategy development process. These principles will be described in greater detail in our paper, but very briefly, the first principle is anticipate and prevent. Anticipate and prevent is better than react and cure. In Colin Isaac's words, "Pollution is expensive, prevention is much cheaper".

The second principle is full cost accounting - for resource use and environmental costs.

The third is informed decision making.

The fourth is living off the interest that the environment provides, rather than its capital.

The fifth is called quality over quantity which means reducing the generation of waste and shifting to products and services which have minimum impact on the environment.

The sixth is respect for nature and the rights of future generations. The Ontario Round Table has adapted these six principles to guide the discussion process. The process is intended to facilitate the forging of new partnerships by opening new ways of thinking about workable solutions for the common good - and for our common future, to use an oft repeated phrase these days.

To help build the links Ontario needs between our environment and our economy, the Round Table, will soon set in motion two initiatives - a public involvement program and six sectoral task forces.

The Round Table will reach out to communities across the province to present its six principles and proposed milestones for action before the public, for public discussion.

A number of topic areas will be covered in these discussions, including: Water, Food and

Agriculture, Forestry, Waste, the Changing Atmosphere and what we are calling Livable Communities.

Many of these are interrelated and may not cover all that needs to be addressed in developing a sustainable society. However, they will provide a basis for applying the Round Table's six principles for change.

At the same time, public input and study of these topic areas by six sectoral task forces will help to ensure that the directions, milestones and actions we choose are soundly based and reflect the values of the people of Ontario.

These sectoral task forces, comprised of representatives of industry, government and other groups, will examine, with your help and active involvement, how the Food and Agriculture, Forestry, Energy and Minerals, Manufacturing, Transportation and Urban Development sectors can achieve sustainable development.

In addition, the Round Table will initiate research projects in the technical, resource management, investment decisions, and institutional structures areas, and also encourage relevant demonstration projects.

Sustainable development for Ontario, requires the elimination of toxic contamination, the use of resources in such a way that their use can be sustained indefinitely, and development that does not deplete our natural resources. Each of us has much to contribute to the realization of these objectives.

The road to sustainable development will not be built overnight. It will be laid, stone by stone, on our collective journey. Recent actions have already yielded positive directions for our journey.

In the area of waste management, for instance, we pretty well know what we have to do. The Round Table has identified a number of directions for change including: Minimizing waste, reusing and recycling. In addition to the blue box program, the

Round Table will advocate the purchase of durable products and products with a high content of recycled material.

A well as improved product design to encourage reuse, increased opportunities for recycling and composting, and increased tipping fees for disposal.

A good example of milestones for waste already put forth by the Ontario government and ones which represent a point of departure for the Round Table are:

* A fifty percent reduction in waste generation, as a minimum, by the year 2000;

* Fifty percent recycling of all paper, glass, plastics, and metal by 1995.

Really, I suppose that what we want to do is work towards a situation whereby there will be no need for an Ontario Waste Management Conference for our kids to attend.

In closing, I want to leave you with the words of a great sustainable development expert from the past. Chief Seattle's reply to Washington in 1854 has been described as the most beautiful and profound statement on the environment ever made.

I will read only a portion of Chief Seattle's reply, though I know that I do so at the risk of offending the true spirit reflected in the entirety of his address.

Chief Seattle said, "This we know: The earth does not belong to man; man belongs to the earth. This we know. All things are connected like the blood which unites one family. All things are connected. Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself".

Thank you for your attention and best wishes for a successful conference.

STREAMLINING THE ENVIRONMENTAL ASSESSMENT PROGRAM

by
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This review of the EA Act and program arises from concerns expressed during 14 years of implementation and the need to examine future application of environmental considerations in sustainable economic development. The review is based on the premise that the Act, and its underlying principles of public consultation, broad definition of the environment, analysis of alternatives and consideration of environmental effects provides for a comprehensive, effective and environmentally sensitive decision-making tool. The paper sets out the Government of Ontario's proposals regarding changes to the Act and its process. The paper recommends specific changes to the Act and the EA program to increase effectiveness and to make the application of the Act more efficient. The paper also examines the application of the Act, or its key principles, beyond its current use.

Some perceive that certain of the legislative requirements of the EA Act have attracted enough attention to become seen as ends in themselves. Other concerns such as inadequate public consultation have become priorities because of the absence of explicit provisions in the Act. The EA program has been criticized for its inefficiency, especially as regards the cost, complexity, and inconsistency of its often time-consuming procedures. These criticisms have been a deterrent to its wider application, which in turn has been a sign of reduced effectiveness in its protection of the environment.

The relationship of the EA Act to other statutes is sometimes unclear and there are criticisms of overlapping authority with other legislation. Application to the private sector has so far been limited. Many important public developments with potential environmental effects have been exempted from the Act. Application to government plans or programs, although provided for in the Act, has not been put into practice. The most frequent application of EA through the class EA procedure is not explicitly provided for under the Act.

The review and approval process required by the Act is often seen to be inefficient. There is concern that the cost of carrying out the EA program by all parties, in terms of dollars and resources, is unreasonably high and processing times are too lengthy and uncertain. Decisions on the exemption or designation of undertakings may also be lengthy and uncertain in timing. The review and approval process applied to individual projects often comes into play late, after many decision related to the project have been finalized. At that time most proponents will have made critical decisions outside the formal process and are disconcerted when called to reconsider them. Complexities in the EA review process are also seen as contributing to inefficiency. Certain requirements e.g., alternatives to be considered, have often been difficult to interpret.

When compared against other environmental assessment models, used in other jurisdictions, the Ontario environmental assessment model generally provides for an effective and environmentally sensitive decision-making tool, which is embodied in legislation. The legislation establishes a very broad definition of the environment, including not only natural environmental impacts but also social and economic. The Ontario model sets out a decision-making process requiring the analysis of alternatives and provides for specific assessment and mitigation of environmental concerns for any undertaking subject to the Act. It provides for public hearings to address and decide upon environmental issues and provides for intervenor funding for all parties involved in the hearings process. A hearing under the Act can be linked with other statutory hearings through the *Consolidated Hearings Act* (CH Act), which provides for a single consolidated hearing. The model provides for a comprehensive technical analysis related to the technical acceptance of documentation required by the Act and a second stage analysis regarding the approval of an undertaking. It is comprehensively applied to public sector undertakings and can be utilized for private sector undertakings, as well. The fourteen years of experience now gained with the Act has shown the effectiveness of the Act in many situations. This implies that the underlying strength of the Act be retained and made more effective. In attempting to retain the strengths of the Act, while resolving the problems associated with it, the following principles were used and provide the basis for the recommendations contained in this paper.

1) Shared responsibility.

2) Effective application of Act.

3) Consultation.

4) Effectiveness and efficiency.

5) Assured process.

PLANNING AND CONSULTATION

Consultation with affected parties has become an essential part of the planning of any undertaking under the EA Act. Consultation during EA preparation provides a mechanism for proponents to define and respond to issues and work with the parties to resolve differences before limiting decisions are made and the EA Document is submitted. The Act, however, has no legal requirement for any consultation prior to the release of the Government review of a submitted environmental assessment document. The Ministry encourages the use of public consultation by the proponent at an early stage of the planning of the undertaking, but only by way of a guideline.

Under the present voluntary approach, usually referred to as Pre-Submission Consultation (PSC), many proponents have ensured that the public has been made aware of, and are involved in, their planning process. The extent and effectiveness of such consultations vary from proponent to proponent. At times the rules and objectives are unclear to both the proponent and affected parties, which often leads to confusion in the process and unsatisfactory results for everyone involved. Initiating consultation too late in the process after key decisions are made can result in unresolved public concerns surfacing after the proponent has completed its planning and the EA document is submitted for review and approval. Trying to resolve these concerns at the government review stage has lead to serious delays in the approval process. The introduction of requirements for public consultation and the development of guidelines for effective consultation are two changes which can streamline EA reviews and result in more timely approvals.

Initial Public Notice and Consultations

When the EA Act applies, it is recommended that a new phase, Planning and Consultation (PAC), begin the process. From the problem or opportunity statement defined by the proponent, the proponent then proceeds to establish the purpose and general nature of the undertaking and starts to identify alternative ways to meet the purpose. At this time the undertaking is still conceptual and not specifically defined or located. It is at this point that a proponent must begin its consultation process with potentially affected government agencies and public.

The proponent's public consultation should begin with a notice to the public after preliminary work has been completed. The provision of such a notice should be mandatory. This notice should be given early in the process once preliminary alternatives, study area(s) and potentially affected public are identified. The form and means of notice would be defined by regulation to include:

- a description of the purpose of the undertaking;
- the proposed study area;
- the name and address of the proponent contact person; and,
- the date, time and location of an opportunity for the public to obtain further information concerning the undertaking.

This regulation would also include a short list of mandatory recipients of the notice, including those in the proposed study area, the municipal clerk(s) and any other concerned public identified by the proponent. Notice to those government agencies with an interest in the undertaking would be by letter.

Another key aspect to an effective planning and consultation phase is the degree of guidance given to the proponent when developing its planning process and preparing its EA document. There is a clear need for the preparation of generic activity (e.g., highway projects, waste facilities) guidelines that could be used by various proponents in preparing their environmental assessments. To this end, it is proposed that the Ministry prepare these generic activity guidelines. These, in conjunction with the other core review agency guidelines, are seen as imperative if proponents are to be given effective advice and consistent direction at the start of and throughout the EA process.

Role of the Public

There is an increasing demand for the public to be involved in planning the laws, policies and projects that will affect their lives and the environment. Public consultation in such areas as local and regional planning, resource conservation and environmental protection has evolved steadily since the early sixties. The principle of public consultation is now integrated to various extent in many public and private decision making processes, including the EA process.

The public has a major role and responsibility in determining the success of a public consultation program. The extent to which they become involved, the issues they raise, and how they attempt to resolve issues all influence the effectiveness of the consultation process. Initially this requires some diligence of the parties to recognize when public interests may be affected and to take advantage of opportunities for consultation. In order to effectively participate in such a process the public must be adequately informed. This requires the proponent to make appropriate information available and the public to use this and other sources of information to educate themselves about the specific details of the planning process and project issues. There follows a responsibility to make their views and concerns known to the proponent as soon as possible in the process. Once issues are identified there is a need for forthright efforts by the proponent and the public to be open and flexible in their respective positions and attempt to seek acceptable solutions or compromises. There also needs to be a clear understanding among the participants and the proponent about their respective roles in, and expectations of, the consultation process. The type of information required, time frames and opportunities for input and how their input will incorporated in the decision making process are key questions the public will ask. This mutual understanding is particularly important where public liaison or advisory groups are used as a primary mechanism for consultation.

It should be recognized that although consultation will not always resolve all differences there are still benefits. The involvement of the public will produce the dialogue that is the first step to recognizing and accepting different points of view and working to develop consensus. Unresolved issues and the efforts at resolution should be well documented in the EA document. The Board should take into account the extent to which all parties have contributed to the consultation process in attempting to resolve concerns.

In order to ensure that public consultation begins as early in the process as possible, it should be mandatory for the proponent to meet with the interested public soon after the initial public notice has been published. In order for such a meeting to be effective, the proponent must be in a position to share basic information concerning its problem or opportunity with the public. It is felt, therefore, that the proponent should be required to prepare documentation on its planning process that can be shared with the public at the initial meeting. This documentation, to be referred to as the Assessment Design Document (ADD), would be in draft form for public review and comment.

At a minimum the ADD will include:

- a description of the purpose of the undertaking;
- the proposed study area;
- the proposed "alternatives to" and proposed "alternative methods" under consideration;
- a consultation plan detailing proposed consultation with both the public and government agencies;
- a preliminary listing of issues/concerns that will be addressed by the proponent;
- a preliminary listing of studies; and
- framework for preparing the environmental assessment document.

Although the initial notice and public meeting are to be mandatory under the Act, it is felt that a considerable degree of flexibility should be given to proponents in carrying out public consultation during the Planning and Consultation phase. The proponent should allow for public review and comment of the consultation plan as part of the initial session. To facilitate this review the Consultation Plan included in the ADD would provide the following:

- identification of affected public and government agencies;
- notice provisions, both mandatory and discretionary depending on the consultation proposed by the proponent;
- the methods of consultation to be used by the proponent including such things as type of meetings, newsletters etc.;
- opportunities for consultation with the public and a general schedule showing when these opportunities would occur in the study;
- the objectives of the consultation plan and any proposed terms of reference;
- methods of dispute resolution to be used in the planning and consultation phase; and
- any funding provisions to be provided by the proponent for use by the public.

The proposed ADD would be available for presentation and public review at the initial public meeting. In effect, it would propose the methods and limits to the proponent's planning process and allow the public to have input as to what that process should be. At the meeting the proponent would inform the public of their definition of the problem/opportunity, their proposed "alternatives to" and "alternative methods" to be considered, the proposed study area, the study process to be used, and the proposed consultation plan. They would identify those that were felt to be the interested members of the public and seek out any other groups or individuals that would have an interest in the EA.

The intent of requiring the draft ADD at the initial public meeting is to provide for public input into the proponent's planning process that will be followed for the environmental assessment. After this initial session, the proponent must prepare the final ADD including any modifications to its issues/concerns list, study area, terms of reference, consultation plan and list of "alternatives to" as a result of public input. The proponent should provide for any subsequent input beyond the initial meeting if such is required prior to finalizing the ADD.

It is felt that the proponent should have two mechanisms available to use in finalizing the ADD. The first avenue available to the proponent would be the filing of its finalized ADD with the Environmental Assessment Branch. No approval would be given to the document, but Branch staff would review the document and provide written comment to the proponent on whether it was felt that its process would be reasonable in meeting the requirements of the Act.

The second avenue available to the proponent and the public would be the provision of a scoping mechanism to finalize the ADD and to ensure that the decisions made within the ADD received formal approval. Within 60 days of the initial public session and upon filing the ADD with the EA Branch, either the public or proponent could request a formal scoping session to take place. The scoping session would be open to all affected parties. It is proposed that it be presided over by the Environmental Assessment Board. The Board would develop procedures to assess the merits of any request for scoping and determine whether scoping should take place. Members of the Board would function in a manner similar in concept to a Master in the law courts. The ADD would be used as a basis for discussion at the scoping session with a view to determining whether it was appropriate for carrying out the environmental assessment. The EA Board member would issue a decision regarding the proponent's ADD and its proposals concerning alternatives to, proposed study area etc. Such a decision would finalize the ADD and would give firm guidance to the proponent in carrying out the remainder of the Planning and Consultation phase. This scoping session and subsequent decision would also serve to bind the decision on acceptance/refusal of the EA, the Minister's decision on approval of the undertaking and any subsequent Board hearing, although it is felt that the decision should be open to modification in light of any unforeseeable, important issues that might arise after the scoping session. These would be admitted to a hearing only at the discretion of the Board.

The ADD, therefore, would set boundary conditions for both the public, affected agencies and the proponent in preparing the environmental assessment document and give guidance to any approval that may be given to the EA. The proponent would continue to undertake its consultation plan and attempt to resolve site specific issues that are raised by the public during the remainder of the Planning and Consultation phase. The EA document should contain a section detailing the consultation plan and the results of the consultation that has taken place with the public. This would also include how the issues raised were resolved or how the proponent and participants attempted to resolve the concerns. This section on public consultation, therefore, would become an integral part of any EA document.

In the case of many undertakings, the public often needs expert, independent advice in evaluating the complex or highly technical factors involved. Sometimes the public is more confident in the ability of an "outside" expert to provide objective information and analysis. In an effort to encourage as much public involvement as possible, proponents will be encouraged to provide participant funding during the planning and consultation phase of preparing an individual EA. While mandatory funding is not recommended, it is felt that both the proponent and the Planning and Consultation phase would benefit from such funding. It is also proposed that any decision on funding to be provided by the proponent under the *Intervenor Funding Project Act* (IFPA) at the hearing stage take into account any funding that has been provided during the Planning and Consultation phase. It is also proposed that the EA Board be given the duty, if requested by the proponent, of recommending the distribution of any funding provided by a proponent during PAC.

The EA Coordinator should be extensively involved in the Planning and Consultation phase. The task of the Coordinator during public consultation should be to advise the proponent to ensure, as far as is possible, that the EA is properly scoped, that public consultation methods are adequate, and that all the appropriate publics are provided with the opportunity to be involved. The coordinator should also provide the proponent with consistent direction with respect to the required content of the EA document and constructive advice on the issues to be addressed in the EA. The EA coordinator would be responsible for determining the EA document adequately deals with those requirements and issues, including those that have been raised by the public and promptly advising the proponent of any deficiencies.

The EA Coordinator should be a facilitator and encourage the settlement of issues by direct negotiation between the parties concerned. The EA Coordinator's role should be to suggest alternative means to reach the goal of developing a satisfactory EA document. The result would be to eliminate or significantly reduce the outstanding issues to be resolved during the EA review period thereby achieving more timely completion of the Review.

REVIEW AND ACCEPTANCE

The second phase of the environmental assessment process is review and acceptance and begins once the planning and consultation phase is completed. The ADD is used as the basis for preparation of the EA document and EA document is formally submitted to the Minister for approval.

The current review process has come under a considerable amount of criticism from proponents, reviewers and the public for the length of time it takes, the inconsistent positions, the uncertainty of reviewers' roles and responsibilities, the complexity of acceptance options and uncertain the role of public participation. Because this phase of the process is administratively controlled by the Ministry and primarily involves other government agencies, it is an important area in which to make improvements.

At present there can be a delay of several months to two years between the proponents last consultation during the study and the Notice of Completion of Government Review announcing the thirty day public review period. This delay can cause the public to lose touch with the project's progress and current status in the EA review and approval process. Such a hiatus can also be counter-productive in resolving public concerns. It is important therefore, that continued public consultation be maintained during the review and acceptance phase and that a public notice of EA document submission be issued by the proponent at the same time as formal submission to the Ministry.

The notice should indicate the opportunity for the proponent or the public to request a hearing upon submission of the EA document. In situations where a proponent requests a hearing the Minister's referral to the EA Board could be made before the review is complete. This would enable the Board and other parties to begin administrative preparations for the hearing sooner including a pre-hearing, and reduce the time between the Decision on Acceptance/Refusal and start of the formal hearing.

Currently, the government review is primarily concerned with determining if the EA is acceptable. It provides an evaluation of the technical quality and completeness of the EA in meeting the requirements of the Act, in particular the requirements set out in subsection 5(3) of the Act, and the strengths and weaknesses of the planning process. It also determines if the specific concerns of the review agencies are adequately addressed. Based on the evaluation and comments of the government review team, the review states a position and makes comments on the overall acceptability of the EA.

The government review has come under considerable criticism from proponents, public and reviewers. The most common complaints concern the complexity, inefficiency and time it takes to complete. There is uncertainty created due to a lack of well defined time limits and study requirements. Reviewers often do not know how their comments will be incorporated and question the EA Coordinator's role in the review process. Others note there doesn't appear to be any sense of urgency or efficiency in the processing of reviews by the Ministry and review staff in other ministries.

Insufficient staff, a clear understanding of what is required, a lack of trained staff dedicated to the review function and failure to meet deadlines are some typical problems encountered with review agencies. As a result, comments from government reviewers are often not as complete and focused on their mandates and issues as required. Issues are not always addressed thoroughly by the responsible ministry and positions established in the review are sometimes altered at a hearing. A clear statement of review expectations within the review agencies and trained staff and responsible for preparing review comments would help improve quality and reduce the time required to complete the review. The Ministry should ensure it has review guidelines and should work with all reviewers. The EA Coordinator should actively facilitate the review and resolve problems by directing and focusing reviews on contentious and unresolved issues. Where an important concern has not been addressed the EA Coordinator should take the initiative to obtain the necessary information from the appropriate agency or through independent sources.

Under the present process, the public review does not begin until after the government review is completed and the Notice of Completion is issued. A separate public review period appears inefficient and does not allow for public comment to be a part of the formal government review of the EA document. The public review, therefore, should occur at the same time as the review by agencies and incorporated into a single "Review." The EA Coordinator would be responsible for facilitating the public review and including public comments in the Review. Including the comments of the public would also contribute to the scope and perspectives contained in the Review. The public should also have the opportunity to assess how the Review has dealt with their comments and request a hearing during a second review period of twenty days following the Notice of Completion of Review and Decision on Acceptance or a subsequent Notice of Acceptance Decision made by the EA Board.

The proposed Review should present a Ministry position on acceptance of the EA document based on the Branch's own analysis and consideration of all the comments of ministries, government agencies and the public. It should make a specific recommendation on acceptance/refusal, with supporting reasons, and outstanding matters and include proposed terms and conditions regarding the approval decision. It should be as comprehensive and factual as possible in dealing with areas and issues critical to the decision and clearly summarize and consolidate all positions. The Review would continue to be prepared by the EA Branch.

ACCEPTANCE/REFUSAL OF THE EA DOCUMENT

Currently, the Minister of the Environment makes two separate decisions. The first relates to acceptance of the EA document and the second on approval/refusal of the undertaking. It is important to note that the Minister does not have the specified authority to refuse the EA document. The Minister may refer decision-making authority to the EA Board under the EA Act or to the Joint Board under the CH Act. The requirement for and distinction between these two decisions is an initial source of confusion. The adequacy of the EA document is essentially a technical evaluation as determined by the EA Branch with the benefit of comments from other government reviewers. It is primarily a technical and administrative decision that the document is functionally complete and its content technically adequate to proceed with making a decision on the approval of the undertaking. To provide the necessary authority and accountability to effectively implement the Act, it is proposed to expand the current authority of the Minister to accept the EA document by adding a provision for refusal. Authority to make this decision would be delegated to the EA Branch Director by regulation. With authority to make this decision, the Director, through the EA Coordinator, is in a much stronger position to advise or require proponents to deal with issues and requirements during PAC that are necessary for an acceptable EA document.

Presently when the Minister refers both acceptance and approval decisions to the Board, the hearing deals with both matters simultaneously. The EA Board has indicated it considers the acceptance decision as relating to form, content, and adequate process and would prefer not to have to deal with those issues in the approval hearing. In the Board's opinion considerable time may be spent during the hearing arguing whether the EA document is acceptable, or in making amendments. Hearing time and cost could be saved if an approval hearing did not begin until an acceptable EA document was available. Delegation of the acceptance/refusal decision to the Director will help achieve this objective.

If the Director refuses to accept the EA document a provision for the proponent to appeal to the EA or Joint Board should be available. Because a refusal decision can stop the EA application from proceeding further, a right to appeal is necessary. The appeal hearing would only deal with the specific reasons for refusal as stated in the Director's decision. The decision of the Board would be final. The right for other parties to appeal an acceptance decision is not felt to be required since there are subsequent opportunities to address issues with respect to approval including a request for an approval hearing and appeal the approval decision itself.

There are a series of optional decisions presently available to the Minister with respect to acceptance. Experience suggests these create a complex and potentially prolonged decision-making process. During the review the Minister may give "notice of intent" to require the proponent to conduct further research, order the proponent to carry out further research, issue a notice and allow time for further comment on the revised EA, accept the EA, amend and accept the EA or refer the EA to a hearing. Most of these provisions relating to further research and amendment of an EA are infrequently used. Most proponents voluntarily agree to provide additional research when requested. The elimination of these redundant or seldom used options would simplify and reduce complexity in the acceptance process. The delegated authority of the Director to make the acceptance/refusal decision should provide incentive for proponents to comply with direction given during the PAC phase and amend an EA Document if requested by the Branch therefore eliminating the need for the provisions of sections 10, 11 and 12 of the EA Act.

APPROVALS

The third phase of the proposed revised EA process deals with the approval of an undertaking by the Minister or Board.

There is a widely held concern that it takes an excessive amount of time to obtain approvals under the EA Act. Decisions on approval or referral to the EA Board for hearings contribute substantially to the overall time for approval. The length of time, cost and procedural inefficiencies of EA hearings are major sources of problems for participants and the Board itself. Provisions for appeals of approval decisions and clarification of decisions also need to be considered.

MINISTER'S DECISION

Section 14 of the Act gives the Minister the authority to give approval to proceed with an undertaking, give approval subject to terms and conditions, or refuse to give approval. Sections 12 and 13 of the Act provide for the Minister to require the EA Board hold a hearing with respect to both acceptance of an EA document and approval of the undertaking. Since there are no maximum time limits set for these decisions by the Minister, this contributes to the overall uncertainty of timing in the approvals process.

The Minister's decision-making powers under the Act, mainly in sections 13 and 14, are not explicitly transferred to the EA Board at the time of a hearing although common practice assumes that they are under section 20 of the EA Act. Arguments have been made before the Board, however, to the contrary and a clarification of the matter would avoid any future misunderstandings.

To complete the provision of certainty and establish a predictable timetable for the entire review and approval process, a reasonable time limit also should be established for the Minister's decision on approval or referral to the EA Board. A target of 180 days from EA document submission to approval or referral is recommended. The Minister's decision, therefore would have to be issued within sixty days of the publication of the Notice of Completion and Decision on Acceptance/Refusal.

The ability for anyone to request a hearing after submission of the EA document should be provided to improve efficiency and avoid confusion. The proponent should be able to request a hearing upon EA submission as is presently provided for under the CH Act. Proponent, public and other intervenors would have a period to request a hearing from the date the EA document is submitted until the end of the twenty day review period following the Notice of Completion and Acceptance Decision or any subsequent Notice on Acceptance. The Minister may refer a proponent's request to the Board upon submission, but a decision on other requests would not be made until after completion of the Review and the twenty day review period.

To continue the scoping initiatives introduced during PAC, the Minister should have authority to limit the matters that are referred to the EA Board. This would allow some initial scoping of the major hearing issues based on scoping and issue resolution during PAC, the Review and comments received on the Review. If applicable, advice should be given to the Minister in the Review as to those matters that should be referred to the EA Board.

To further guide the Minister in determining the necessity for an approval hearing, criteria should be established, similar to those criteria proposed for bump-up requests, (see Recommendation 6.14), that the Minister would consider in making a decision. A guideline should be developed concerning the use of the criteria to help establish and evaluate legitimate requests for a public hearing. Once the decision on a hearing request is made by the Minister, the decision and reasons should be made public.

APPEALS AND CLARIFICATION

As discussed in earlier, a decision by the Director of the EA Branch to refuse acceptance of the EA document will have major implications for the proponent. Therefore, provision should be made for the proponent to be able to appeal a refusal decision to the EA Board within twenty days of the decision. The proponent would have the option of requesting a separate hearing on acceptance or requesting consecutive hearings on acceptance and approval. The approval hearing could only proceed after a positive acceptance decision. This type of appeal hearing would only deal with the specific reasons for refusal. It should be shorter compared to current hearings. This revised approach to acceptance would eliminate time currently spent at the main approval hearings arguing and supplementing deficiencies in the EA document and would allow the Board to focus the hearings on approval of the proposed undertaking.

MONITORING

Monitoring is the last aspect of the EA process. There are concerns that insufficient attention has been paid to post-approval monitoring, and that the EA Act contains no specific monitoring requirements.

A monitoring program can have three main uses. It can determine the level of compliance with conditions of approval or exemption or other standards; an enforcement program can be developed to give assurance of compliance; and monitoring can be a source of information for the study of environmental effects.

In the absence of any consistent follow-up activity by the Ministry, proponents have shown little interest in monitoring. The current practice of voluntary self-compliance by proponents with minimal reporting is unsatisfactory.

Compliance monitoring is the use of monitoring to show how well an undertaking has been constructed, implemented and operated in accordance with the standards, terms and conditions of approval, and commitments contained in the EA document.

Responsibility for meeting approval and exemption requirements rests with proponents. The Minister and the EA Board regularly attach terms and conditions to approvals. Certain decisions on approval would not have been given without specific terms and conditions attached. The Board has expressed concern that certain conditions established on approval are not being monitored for compliance and there is no formal process or procedure in place to monitor compliance.

In 1986, the EA Branch issued a report entitled *Environmental Assessment Compliance Monitoring Program Proposal* for discussion. The report outlined the principles of and mechanisms for compliance monitoring and reporting during project implementation. The intention was to rely on the voluntary cooperation of proponents to provide information to the EA Branch to confirm terms and conditions were met. This proposal has not been finalized. The *Interim Guidelines on Environmental Assessment Planning and Approvals* issued in July, 1989, do not include any reference to compliance reporting or monitoring.

The EA Act should be amended to require the proponent to provide the necessary reporting, documentation and verification to demonstrate compliance. For administrative support, the Ministry should develop the appropriate reporting, review and enforcement mechanisms and procedures to administer a comprehensive compliance monitoring program.

To strengthen the effectiveness and integrity of monitoring programs the Ministry should audit one or two projects each year.

To encourage and facilitate the integration of compliance monitoring and predictive methods used in EA studies, the Ministry should place more emphasis on empirical evidence to strengthen EA predictions, particularly in areas of recurring concern. Sharing and exchange of impact research, assessment methods and mitigation techniques should be supported and further research in EA through existing Ministry research programs.

APPLICATION OF THE ENVIRONMENTAL ASSESSMENT ACT

There are a number of ways in which Ontario's EA program may be applied to an undertaking. Public sector projects may be subject to the EA Act through an individual EA or a class EA or be exempted. Projects under a class EA may be bumped up to individual EA status, when their environmental effects are seen to be more adverse than anticipated or there is some other controversial matter. Private sector projects are subject to the Act only when designated. Application issues may also be found where there is a possibility of interaction between the EA Act and another statute. Since administration of the program involves so many questions of application, the development of clearly defined procedures and of criteria to assist decision-making is a key issue.

All public sector undertakings are subject to the EA Act unless exempted under section 29. Exemptions may be granted "in the public interest having regard to the purpose of the Act and weighing the same against the injury, damage or interference that may be caused to any person or property by the application of this Act...".

A Ministry document *Project Screening and Applications for Exemption Orders under section 29 of the EA Act* is a guide to how and why the Act has been applied to public sector projects, and provides project screening criteria for evaluating exemption requests. The three project screening criteria presented in the Ministry guideline document are: absence of environmental significance, emergency situation and overwhelming public interest. More detailed criteria are necessary.

Many exemptions were granted in the early years of operation of the Act while waiting the completion and use of class EAs. More recently the number of exemptions granted have ranged between 20 and 30 annually. Since 1983, out of more than 180 exemption requests about 150 have been granted and seven rejected, the remainder being still in process. The preponderance of exemptions granted has led to the opinion that the provision may have been misused.

The efficiency and certainty of exemption procedures are also in question. A standard format is needed for exemption requests. The duration of the formal process averages about six months and has ranged, for individual requests, between a few days in emergency situations to 27 months. Time limits should be established for the exemption process.

PRIVATE SECTOR DESIGNATION PROVISION

The designation process, as currently employed to apply the Act to undertakings in the private sector, is criticized for its uncertainty, inefficiency and *ad hoc* nature. No criteria have been published by which to judge the suitability of "major" projects (EA Act clause 3(b)) for designation and to guide the public in requesting a project to be designated. Not including any preliminary period of negotiation between the party making the request and the proponent, the duration of the formal process has, in practice, varied between one to 28 months, averaging about six months. Over the course of the 1988-89 fiscal year, of 46 designation requests under review, eleven were denied, 2 were granted and 3 withdrawn. Since 1983 over 90 requests for designations have been made. Twelve projects have been designated. A guideline should be developed related to all aspects of designation requests.

PRIVATE SECTOR APPLICATION

The application of EA to private sector activities using screening or listing devices as is currently the case, or is being considered in other provinces, indicates a need for Ontario to consider these devices in any expanded application of the Act that may be required to address the possible extension of the federal Environmental Assessment Review Process (EARP) process in Ontario. Application of the EA Act to the private sector has been accomplished for a limited number of types of undertakings where the private sector has been viewed as competing with the public sector. Two examples are waste management activities and non-utility power generation. Such similar undertakings should be subject to the same type of planning and approval process.

The Ministry should continue to develop a comprehensive strategy in the ongoing designation of the waste management sector. At present private energy from waste facilities handling more than 100 tonnes daily are designated under the Act. The Ministry has also announced its intentions to designate certain other waste management activities. The designation of non-utility hydro-electric generators should occur in recognition of the Class EA currently under preparation for this type of activity. This last consideration derives from the need to have similar type undertakings addressed by similar approval processes.

The class EA process starts with production of a parent class EA document describing a procedure for planning and implementing projects within the class. The document is approved through the individual EA review and approval process, as a result of which the procedure is authorized. Projects planned and implemented through an authorized class procedure then have approval status as if received through the individual EA review and approval procedure.

Within the class EA process, responsibilities are shared between the Ministry and proponent agencies. A representative of the proponent agencies prepares the parent class EA document, laying out the procedure to be authorized including ways of accounting for environmental concerns, provision for public involvement and the consideration of alternatives; the Ministry has responsibility for the review and approval of the document. Once the document has been approved, proponents are authorized to proceed with projects within the class, provided the approved procedures are followed.

Most authorized procedures incorporate a screening process which separates projects into categories reflecting environmental impact. Typically, but not invariably, projects in the first category have no significant environmental effect and may proceed without further involvement in the class EA procedure. Projects in the second category may likewise proceed, but only with the agreement of other agencies and parties specified in the parent class EA. For projects with greater impact, proponents have to complete a more detailed procedure which concludes with the filing of what is commonly referred to as an Environmental Study Report (ESR) or equivalent as specified in the parent class EA. The ESR explains such matters as the project purpose, environmental conditions in the project area, planning options, construction, operations and maintenance requirements and their environmental effects, and requirements for mitigation activities and monitoring.

Recurring criticisms of the use of class EAs are raised on the grounds that no explicit definition has been given of the types of projects suitable for assessment by the process. The understanding that class EA projects would be ones that occurred frequently, were of a limited scale, and had only limited and generally predictable effects on the environment, has not been enough to prevent some large projects with significant effects following through the process. A guideline should be issued with a more detailed statement of suitable project characteristics e.g.; recurring, similar in nature, limited in scale and having a predictable range of environmental effects, and responsive to standard mitigation measures. This would include recognition of those projects currently identified in approved Class EAs.

Parent class EAs now current show much inconsistency in their authorised procedures, both in content and terminology. It is intended to standardize the components of class EAs as far as possible. Flexibility must remain, however, to provide for class EAs that are not adaptable to standardization. A model class EA procedure should be developed as a guide to good practice and facilitate future development of class EAs. Certain components for which legal authority could possibly be provided are reviewed below.

Although all Ministry class EA procedures contain provisions for public input, the procedures are inconsistent and uniform minimum requirements should be established. The same inconsistency applies in requirements for assessing or developing and reporting on environmental impacts, and in developing and reporting on mitigative measures and monitoring programs.

Another question concerns whether a proponent may begin to implement at least part of a project immediately following filing of the ESR, or have to delay all activity until the period for requesting bumping-up of a project under a class EA to an individual EA has passed.

The current practice of setting a date for the review of a parent class EA should become a legal requirement. Between reviews proponents may wish to amend an EA for the purpose of clarification, streamlining of administration or an extension of the class to projects not previously included. Current procedures for amending class EAs vary and allow only limited public involvement. Provisions are needed for the Minister to amend the parent class EA to address administrative changes.

Parent class EA documents are now approved for a specific proponent or for proponent groups. It would be useful to have a procedure for a class EA in use by one proponent group to be adopted by other groups undertaking similar projects. Currently, a regulation is required, as for example was employed to allow the Conservation Authorities Class EA for Water Management structures to be used by municipalities. A more convenient administrative process should be made available.

A bump-up provision allows the assessment requirement of a project to be raised from class EA to individual EA when the environmental effects are found to be more severe or unpredictable than anticipated and also where serious public concerns exist. Currently there are no criteria published for evaluating bump-up requests, no consistent statement of the process used and no time limits on the process. The result is delay and uncertainties of timing. Furthermore, the absence of criteria assists the use of the bump-up provision as a delaying mechanism, since a bump-up request can under some circumstances put on hold a proponent's progress through a class EA procedure.

BEYOND THE PRESENT PROGRAM

Within Ontario, some have exerted pressure for broader application of the EA Act to the private sector as well as demanding recognition of environmental concerns in government policy and program development. Planning processes used for a number of government programs recognize the need for public consultation, environmental impact assessment, and examination of alternatives; these processes have also drawn considerable public interest.

At the national level, the Environmental Assessment and Review Process (EARP) is the means by which the concept of environmental assessment is applied to all departments, boards and agencies of the Government of Canada. The EARP was instituted as an administrative mechanism first by Cabinet decision in December, 1973, and given further legal authority with the issuance of the Environmental Assessment and Review Process Guidelines by Order-in-Council, in June, 1984.

At present the EARP Guidelines Order applies to any proposal:

a) that is to be undertaken directly by an initiating department;
b) that may have an environmental effect on an area of federal responsibility;
c) for which the Government of Canada makes a financial commitment; or
d) that is located on lands, including the offshore, that are administered by the Government of Canada.

A review of these criteria for application of EARP indicates considerable potential for application to many private and public sector areas of activity in Ontario. This appears to be particularly true when considering the extent of Federal financial support to many projects or far reaching legislation as the *Fisheries Act*.

The EARP is a self-assessment process with an initial assessment phase and a public review phase. It addresses the potential environmental and directly related social effects of proposals and attempts to integrate relevant engineering, ecological, social, and economic consideration in project decision-making.

In recent months, decisions by the Federal Court of Canada on the Rafferty - Alameda Dam project on the Souris River in Saskatchewan and on the Oldman River Dam project in Alberta have focused attention to the manner and interpretation of the application of the EARP process to proposals. The result of these recent decisions appears to influence the discretionary elements of EARP by the initiating department to the extent that the application of EARP, including the establishment of panels to conduct public hearings, could be required for all proposals which have impacts that are not insignificant and not mitigable by known technology. These decisions appear to have given the EARP the status of legislation of general application.

The Canadian Environmental Assessment Act was recently tables in the House of Commons for further study by the Legislative Committee of the House. When proclaimed, the legislation will bring an end to the uncertainty created by the recent court decisions. As well the draft legislation places emphasis on the need to allow for the expression of public concern and to provide a full opportunity for the public to participate in the environmental assessment and review process. In addition, the independence of the review panel must be guaranteed.

The proposed changes to Ontario's EA Act will appropriately address public involvement in the planning and review process of EA but minimization of conflicts between the new federal EARP and provincial EA process is required. The Oldman River decision appears to give little weight to long-standing administrative arrangements involving Federal and provincial agencies that informally addressed the requirements of the EARP. Steps should be taken to overcome the potential liability of federal designation (application of EARP) to large projects in Ontario even if the provincial EA Act had been applied. This would avoid duplicate application of environmental assessment processes. A similar concern exists for projects that overlap the jurisdictions of Ontario and adjoining provinces.

As the Federal Court decisions also suggest the potential for increased application of the EARP to private sector initiatives in Ontario, this reinforces the need for development of Federal/Provincial joint mechanisms and protocols for application of EA.

Another issue that extends beyond the present application and practise of the EA Act is that of explicit consideration of environmental concerns being taken into account in the development of applicable Cabinet approved policies and programs. The Brundtland Commission, the National Task Force, the Ontario Round Table, and public interest groups all appear to stress the importance of taking such consideration into account. In addition, the attention of government to the concept of sustainable economic development must also reflect current social values as mirrored by the activities of the above-noted groups.

Environmental consideration to be taken into account can be described by the following key principles:

- public consultation;
- consideration of alternatives; and
- assessment of natural environmental impacts.

If policies and programs reflected this approach in their development, then individual EAs on projects stemming from such policies and programs could be considerably simplified through a scoping process linked to this approach.

The challenge of this issue is to respond with an approach that addresses these concerns yet recognizes the executive function in government and acknowledges individual ministerial autonomy within the structure of government. The approach taken must be practicable and not unduly onerous. It must also consider that the planning processes used by Ministries in policy development already recognize the need for public consultation, examination of alternatives and the impacts on the natural environment. The key is to ensure the consideration of these principles based on a framework that is consistent in its application.

Future recognition of environmental considerations in policy and program development can be achieved separate from the EA Act. It must be recognized that Cabinet retains discretion to apply the Act to selected policies and programs. This then leads to an option involving a government policy approach requiring consideration of the key principles.

A framework for such an approach could be as follows:

- Cabinet to retain discretion to apply EA to selected policies or programs;
- government agencies to be responsible and accountable for incorporating environmental considerations as applicable in policy and program development;
- existing government policy development processes or amended processes would continue to be applied;
- the Cabinet approval process would be used to address environmental considerations; and,
- the approach should not affect policies already in place at the date of implementation of such a proposal.

The phrase, "applicable policies and programs" requires clarification. If it is accepted that current social values are pressing for sustainable economic development, achieved through recognition of environmental considerations, then the approach proposed above requires criteria to determine "applicable policies and programs" that might come under such an approach. Such criteria might include:

- physical impact;
- implications for natural resource allocation;
- significant adverse effects on the natural environmental; and
- use of provincial lands exceeding a defined area.

PRIVATE SECTOR

The issues of private sector undertakings and EA must be examined when considering environmental assessment beyond the present program. In 1977 the private sector section of the EA Act came into force, allowing major private undertakings to be designated by regulation as subject to the Act. As a limited number of private sector undertakings have been designated up to this time, it is important to examine the rationale, issues, and options associated with further application of EA to the private sector.

A potentially major impact on this issue is the future direction of the federal EARP program. As discussed previously, recent federal Court decisions point to an increasing full application of EARP to private sector undertakings in Ontario.

Other factors that could be used in determining application of EA to the private sector could include severity of environmental effects using the EA Act definition of environment and the suitability of other provincial legislation to address such effects. The existence of other legislation such as the Planning Act, Ontario Water Resources Act, Mining Act and Environmental Protection Act already subject private sector activities to a complex regulatory review process. This existing regulatory framework must be recognized in any further consideration of extending the application of the EA Act further to the private sector.

The present EA process and specific Act requirements appear to be more suited to the public sector rather than private sector. The requirements to describe "alternative to" and "rationale for" the undertaking may be difficult for the private sector to address in a meaningful fashion. The concept of venture capital undertakings and return on investment do not reflect public needs or benefits that the EA program could be viewed as addressing. Other issues that could be of concern to the private sector include lack of flexibility with respect to siting options, restrictions on confidentiality, and generally meeting the requirements of subsection 5(3) of the EA Act.

One other major issue is the workings of the EA program. The government originally expressed the intention to gain experience with the EA program and streamline the review and approval process before applying it broadly to major private undertakings. Continued criticism of the process for its inefficiency and uncertainty as currently applied leaves doubt over its readiness for broader application. The improvements proposed should make the EA review and approval process better adaptable for application to private undertakings. Experience in implementing the improved EA program would be required before general extension to the private sector is considered.

Before any further consideration is given to extending the application of EA to the private sector, it is important that such application, or other alternatives, be explored in detail and be contingent upon resolution of the issues identifed above. A multi-stakeholder task force would seem the most likely approach to examine these issues further. It is certain that public concern will continue and that pressures from outside the province will focus attention on this matter. A comprehensive study of the following should be carried out:

- benefits and disadvantages of application of EA to the private sector,
- consultation with all affected parties;
- alternatives available to achieve government objectives in this area; and
- interrelationships with other government legislation, programs and policies.

CONCLUSIONS

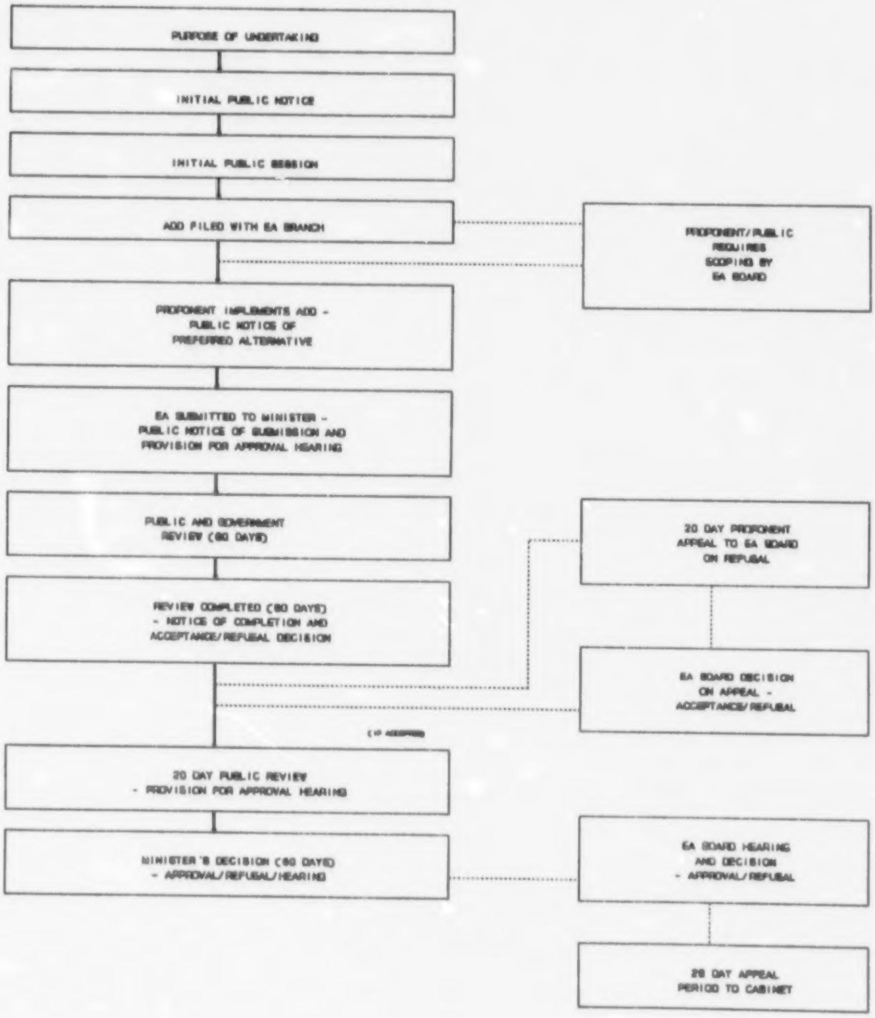
The basic approach of environmental assessment as practised in Ontario is sound but refinement of the EA program is required to provide status to procedures and to maximize the efficiency and effectiveness of program delivery. It is expected that a reasonable planning, review and decision-making process will result in solutions to problems or opportunities of proponents which are accepted by all parties in the circumstances. The EA program will continue to ensure that environmental considerations are taken into account prior to decisions to proceed. The provision of a more clearly articulated process, of practical structural and institutional improvements and of clear criteria to assist in decision-making will facilitate the delivery of the more streamlined program.

As the EA program has evolved over the last fourteen years, refinement in the techniques of assessment have occurred while the expectations of all participants have increased. The practice of EA has expanded beyond the process of collecting data, and providing qualitative documentation in carrying out a simple assessment to a process which is becoming more involved with the techniques of effects prediction and analysis, monitoring, analyzing risk and carrying out public consultation. In Ontario the extension of the application of EA from a project by project basis to reviewing the development of plans, such as, the Ontario Hydro Demand/Supply Plan, suggests a trend to broader application in the future.

This discussion paper focuses attention on the structural and institutional changes that are necessary to provide greater effectiveness and efficiency in the delivery of the EA program.

After all interested parties including the public have had the opportunity to review proposed recommendations and to make their views known to the Envi-ronmental Assessment Advisory Committee, it is expected that the Committee will make a report to the Minister. After consideration of all recommendations, appro-priate statutory amendments will be introduced to the Legislative Assembly and the necessary regulations, policies and guidelines will be developed in consultation with all interested parties.

APPENDIX A
PROPOSED ENVIRONMENTAL ASSESSMENT PROCESS


PURPOSE OF UNDERTAKING
INITIAL PUBLIC NOTICE
INITIAL PUBLIC SESSION
ADD FILED WITH EA BRANCH
PROPONENT/PUBLIC REQUIRES SCOPING BY EA BOARD
PROPONENT IMPLEMENTS ADD - PUBLIC NOTICE OF PREFERRED ALTERNATIVE
EA SUBMITTED TO MINISTER - PUBLIC NOTICE OF SUBMISSION AND PROVISION FOR APPROVAL HEARING
PUBLIC AND GOVERNMENT REVIEW (60 DAYS)
20 DAY PROPONENT APPEAL TO EA BOARD ON REFUSAL
REVIEW COMPLETED (60 DAYS) - NOTICE OF COMPLETION AND ACCEPTANCE/REFUSAL DECISION
EA BOARD DECISION ON APPEAL - ACCEPTANCE/REFUSAL
(IF ACCEPTED)
20 DAY PUBLIC REVIEW - PROVISION FOR APPROVAL HEARING
MINISTER'S DECISION (60 DAYS) - APPROVAL/REFUSAL/HEARING
EA BOARD HEARING AND DECISION - APPROVAL/REFUSAL
28 DAY APPEAL PERIOD TO CABINET

ENVIRONMENT ONTARIO'S INTERGOVERNMENTAL ACTIVITIES

by

Ken Richards, Coordinator, Intergovernmental
Relations Office, Environment Ontario,
Toronto

At the time of assembly of the Proceedings for printing, a text of the author's paper was not available to include in numerical sequence.

If the paper was subsequently received, it is incorporated in these Proceedings following the listing of the Conference Delegates.

Otherwise, those wishing further details on this subject are asked to contact the author direct at the Ministry's office.

APPROVALS - UPDATE AND TRANSITION

by

Tom Armstrong, Assistant Director,
Approvals Branch, Environment Ontario,
Toronto

The author spoke from notes and slides for his presentation. There was no formal text of the paper.

At the time of assembly of the Proceedings for printing, the text of the author's slides was not available to include in the numerical sequence.

If the text was subsequently received, it is incorporated in these Proceedings following the listing of the Conference Delegates.

Otherwise, those wishing further details on this subject are asked to contact the author direct at the Ministry's office.

SESSION II — AIR QUALITY MANAGEMENT

Moderator: S. Toplack, President
Ontario Section, Air And Waste
Management Association

Denis Corr, Manager, Tire Fire Clean-Up
Environment Ontario, Hamilton

B.Madé, Industrial Programs Branch,
Environment Canada, Ottawa

D. Yang, Cabinet office,
Government of Ontario, Toronto

T. Stopps, Air Resources Branch
Environment Ontario, Toronto

THE TIRE FIRE CLEANUP

By

Denis Corr, Manager, Tire Fire
Clean-up, Environment Ontario,
Hamilton

The fire began on February 12, causing dense, choking black smoke to be emitted. This smoke was carried out a considerable distance downwind and resulted in large numbers of people being evacuated.

Five families have had to leave their homes permanently in the aftermath of the fire.

Contamination produced by the fire, fire residues and oil produced from the burning tires have sunk into the ground beneath the site of the fire. Contaminated run-off water due to the fire fighting and subsequent rain had to be contained. Both surface water and groundwater at the tire site have had elevated levels of contamination including Benzene, Toluene and Xylene as well as Zinc, Phenols and Ammonia. Dioxins and NDMA have also been detected in water at the site.

Surface Water

Some surface water escaped to Sandusk Creek in the early days of the fire before surface water drainage containment could be installed at the site. Additional water escaped during the second week immediately after heavy rainfall. Sandusk Creek was contaminated with Benzene up to 50 times the standard of 5 ppb and several hundred times the Toluene standard of 0.4 ppb according to samples taken approximately 1 km. south of the site. However, there appears to be no long term environmental impact in the creek due to the success of efforts to contain the contamination. A water advisory on Sandusk Creek has remained throughout the summer season so that people would not use water from the creek should an extremely heavy rainfall result in a breach in the contaminant ponds.

Surface water run-off and water from the shallow aquifer has continued to improve in quality (contaminant levels are decreasing). This is directly attributable to site cleanup operations including surface materials being consolidated on the site and also to the removal of oil from the subsurface.

Groundwater

Contaminated oil from the fire sunk into the ground, to a depth of less than 10 feet. This oil is contaminating the shallow groundwater in the immediate area of the fire site. There has been no impact to date on domestic wells in the area. Approximately 136 domestics wells have been sampled and no contamination attributable to the fire has been detected. Approximately 90 monitoring wells have been drilled on and in the immediate vicinity of the site. Water contamination in the shallow groundwater on site was at a level which is hundreds of times our drinking water standards. Water quality has improved over the 6 month period since the fire was extinguished. This water is contained in the area of the site. Drinking water normally drawn from the deep water aquifer in this area has not been affected by contamination from the fire.

Reports have been mailed to all owners of domestic wells which were sampled and inspected after the fire. The reports outline the analytical results of the water quality and results of the well inspection. A number of wells showed elevated levels of contaminants directly linked to poor well maintenance. None of the contamination was a result of the tire fire.

Water Treatment

Both surface water run-off after rainfall and groundwater from the shallow aquifer are being collected and either stored in on-site ponds and lagoons or are being spray irrigated onto the site to maintain high water table levels to force oil out of the bedrock and into oil collection sumps.

Approximately 6.5 million litres of the contaminated water were treated by the emergency water treatment plant brought to the site at the height of the fire. The treated water was released to Sandusk Creek. Approximately 2.8 million litres of water were trucked to a temporary holding lagoon at the Clarkson WPCP and eventually were returned to an isolated cell at the Townsend Lagoons. Approximately 10 million litres of contaminated water have been trucked to Townsend Lagoons directly from the fire site.

Natural processes of biodegradation, sedimentation and photodegradation (UV) have resulted in considerable improvements in the quality of the fire site water being held at the Townsend Lagoons. Currently, the water at Townsend Lagoons meets provincial water quality standards. Evaporation (estimated as high as 350 litres/min) has resulted in considerable reductions in water quantities in storage at the Townsend Lagoon.

No excess water was generated at the site during the summer. During July 1990, approximately 1.5 million litres of water were returned from the Townsend Lagoon to the fire site to supplement spray irrigation.

Oil

Large quantities of oil were produced by the fire. Approximately 1,000,000 litres of oil mixture has been collected and this material is currently being disposed of at a hazardous waste disposal facility. The Remedial Action Plan report estimates approximately 10,000 to 50,000 litres remaining underneath the surface of the site. Areas containing oil in concentrated form have been delineated, mainly in the NW and SE areas of the fire site. Recently constructed sumps to drain this oil at the site are not producing large quantities of oil. Oil quantities estimated in the RAP to be remaining in the ground are suspected to be considerably higher than actual quantities remaining. Measurements are being performed to confirm the remaining oil quantities on site.

Contaminated Soil

Soil from the site is non-hazardous but some soil will require treatment and/or disposal.

The Region of Haldimand-Norfolk has established conditions for receiving non-hazardous wastes at the local Tom Howe landfill site and are prepared to enter into negotiations with the ministry.

NOx/VOC MANAGEMENT PLAN FOR CANADA

by

Bernard Madé, Program Engineer,
Industrial Programs Branch, Conservation
& Protection, Environment Canada, Ottawa

The Canadian Council of Ministers of the Environment (CCME) requested in October 1988, that a management plan be developed for the control of nitrogen oxides (NOx) and volatile organic compounds (VOCs). The plan was to be developed in consultation with interested stakeholders and delivered to CCME by October, 1990.

Nature of Concern

The NOx/VOC Management Plan has been developed in recognition of the fact that there are serious NOx and VOC related health and environmental concerns in parts of Canada today. One of these is the elevated levels of ground level ozone, a component of urban smog. Ozone is formed by a photochemical reaction between NOx and VOCs in the presence of sunlight.

More that half of all Canadians are exposed regularly in summer months to ambient air ozone concentrations that are known to cause adverse health effects. These levels are often more than twice the Canadian "maximum acceptable" air quality objective for ozone (82 ppb). During severe ozone episodes, such as those that occurred in 1988, people in some Canadian cities have been advised to stay and limit outdoor physical activity.

Purpose and Scope of the Plan

The NOx/VOC Management Plan has been designed to address the two primary objectives laid down by the CCME in October, 1988. These are that the plan should:

1) solve our domestic NOx and VOC related environmental problems;
2) meet our international obligations.

The focus of the plan is on reduction of ground level ozone. Other concerns with NOx and VOCs, such as direct toxic effects of some VOC compounds, are secondary considerations in the plan. These concerns are being addressed under other programs.

Elements of the Plan

The NOx/VOC Management Plan, First Edition contains 61 specific initiatives for reduction of NOx and VOC emissions and 20 study initiatives designed to provide information for preparing a second edition of the plan in 1994.

Of the 61 emissions reduction initiatives, 23 deal with NOx and 38 with VOCs. For both NOx and VOC control, initiatives are divided into three categories:

- energy conservation and product control;
- consumer choice and lifestyle; and
- source control.

The Plan initiatives are approximately equally divided between those that are national in scope and those that are region specific. Implementation of the initiatives will be shared by federal provincial and municipal jurisdictions.

Effectiveness of the Plan

The plan, when fully implemented, is expected to achieve the following:

- NOx and VOC emissions nationally in year 2005 that are 16% and 19% respectively below current (1985) emission levels, with reduction of about 30% in key ozone problem area.

- a reduction in peak ozone levels ranging from 15 to 35 percent in most areas of concern with respect to elevated summertime ozone concentrations. (There are some areas neat the United States border where no reductions will occur from Canadian action alone e.g.. Windsor, Long Point).

- a reduction in hours above the "maximum acceptable" ozone concentration (82 ppb) ranging from 30 to 75 percent in most areas in primary concern. (Again, no significant change in some areas near the United States border).

Cost of the Plan

The plan will result in significant costs to governments and industry, and is dependent to some degree on consumer adaptation and response to the need for lifestyle changes to improve and conserve the quality of the environment.

The emission reduction costs are estimated to be $630 million per year by 2005. They are split as follows:

- $280 million/year for NOx control
- $350 million/year for VOC control

CCME DECISION - OCTOBER 6, 1988

NOx/VOC MANAGEMENT PLAN TO CCME
IN OCTOBER 1990

MECHANISM: LRTAP STEERING COMMITTEE

PROGRAM TO BE DESIGNED TO:

- SOLVE DOMESTIC ENV. PROBLEMS
- MEET INTERNATIONAL OBLIGATIONS
- HAVE ENERGY EFF. AND CONS. PLAY A SIGNIFICANT ROLE
- CONSULT WITH ALL STAKEHOLDERS

90/05/15

MILESTONES
NOx/VOC MANAGEMENT PLAN

MILESTONE	DATE
CCME DECISION ON PLAN	OCT. 6, 1988
ADVISORY COMMITTEE FORMED	MAY, 1989
1ST MULTISTAKEHOLDER WORKSHOP	SEPT. 6-8, 1989
EXPERT WORKGROUPS MEET	OCT.-DEC., 1989
WORKGROUPS FINAL REPORTS	DEC. 15, 1989
FIRST DRAFT MGT PLAN	MARCH 1, 1990

90/05/15

MILESTONES (cont'd)
NOx/VOC MANAGEMENT PLAN

MILESTONE	DATE
2ND MULTISTAKEHOLDER WORKSHOP	APR. 18-20, 1990
END OF COMMENT PERIOD	APRIL 30, 1990
FINAL PLAN TO LRTAP S.C.	JULY 1, 1990
TRANSLATION AND PRINTING	AUG. 1, 1990
TO CCME D.M. MEETING	SEPTEMBER 1990
TO CCME MINISTERS MEETING	NOVEMBER 1990

90/05/15

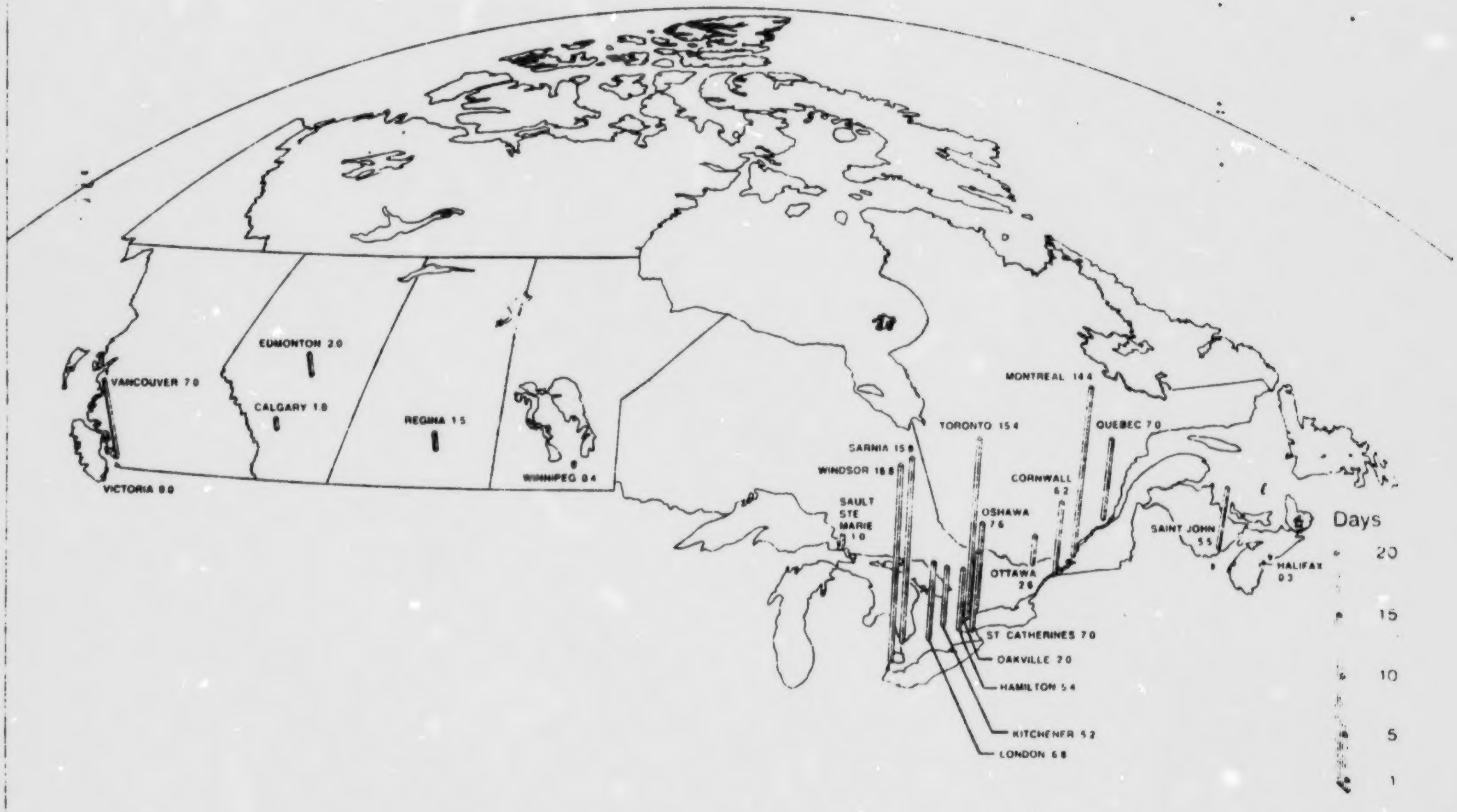

VANCOUVER 7 0
VICTORIA 0 0
EDMONTON 2 0
CALGARY 1 0
REGINA 1 5
WINNIPEG 0 4
SARNIA 15 9
WINDSOR 16 8
SAULT STE MARIE 1 0
TORONTO 15 4
MONTREAL 14 4
QUEBEC 7 0
CORNWALL 6 2
OSHAWA 7 6
OTTAWA 2 6
SAINT JOHN 5 5
HALIFAX 0 3
ST CATHERINES 7 0
OAKVILLE 7 0
HAMILTON 5 4
KITCHENER 5 2
LONDON 6 8
Days
20
15
10
5
1

FIGURE 2 AVERAGE NUMBER OF DAYS PER YEAR EXCEEDING THE ONE HOUR OZONE AIR QUALITY OBJECTIVE (82ppb), 1982-1986

(Average of 3 Highest Years 1983 - 1989)

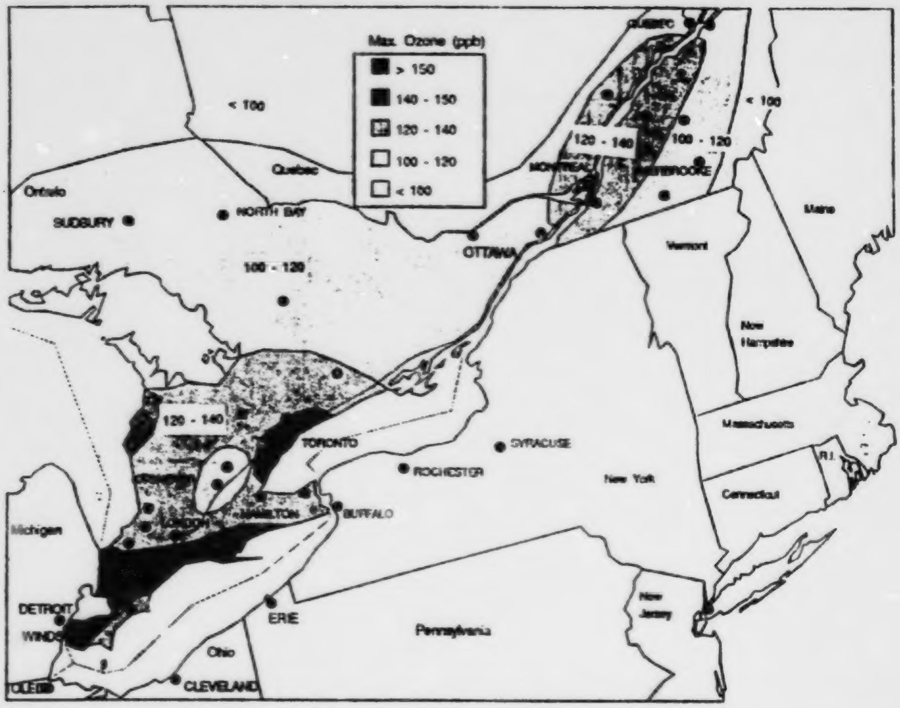

Max. Ozone (ppb)
> 150
140 - 150
120 - 140
100 - 120
< 100
QUEBEC
< 100
< 100
120 - 140
100 - 120
MONTREAL
SHERBROOKE
Quebec
Ontario
SUDBURY
NORTH BAY
OTTAWA
100 - 120
Maine
Vermont
New Hampshire
Massachusetts
R.I.
Connecticut
New York
120 - 140
TORONTO
SYRACUSE
ROCHESTER
HAMILTON
LONDON
BUFFALO
Michigan
DETROIT
WINDS
ERIE
Pennsylvania
New Jersey
Ohio
CLEVELAND
TOLEDO

FIGURE 7 MAXIMUM OZONE CONCENTRATIONS - WINDSOR - QUEBEC CORRIDOR (WQC)

(Average 1983 - 1989)

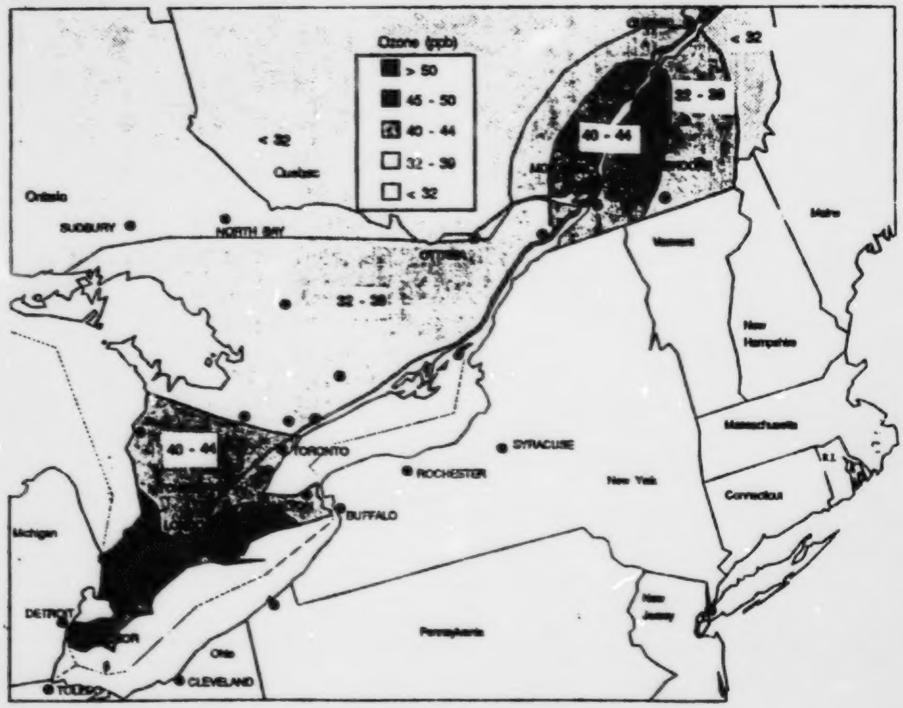
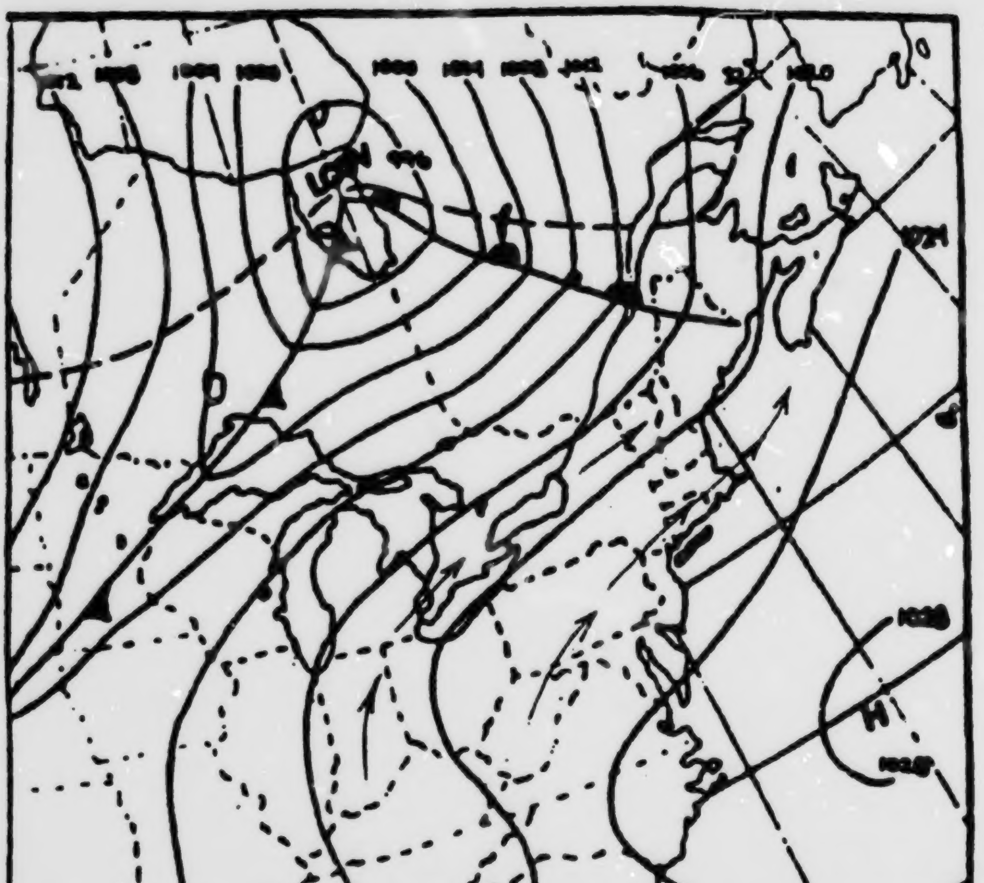

Ozone (ppb)
> 50
45 - 50
40 - 44
32 - 39
< 32
QUEBEC
< 32
32 - 39
< 32
40 - 44
Quebec
Ontario
SUDBURY
NORTH BAY
OTTAWA
32 - 39
Maine
Vermont
New Hampshire
Massachusetts
R.I.
Connecticut
New York
40 - 44
TORONTO
SYRACUSE
ROCHESTER
BUFFALO
Michigan
DETROIT
Pennsylvania
New Jersey
Ohio
CLEVELAND
TOLEDO

FIGURE 8 GROWING SEASON O_3 CONCENTRATIONS - WINDSOR - QUEBEC CORRIDOR (WQC)

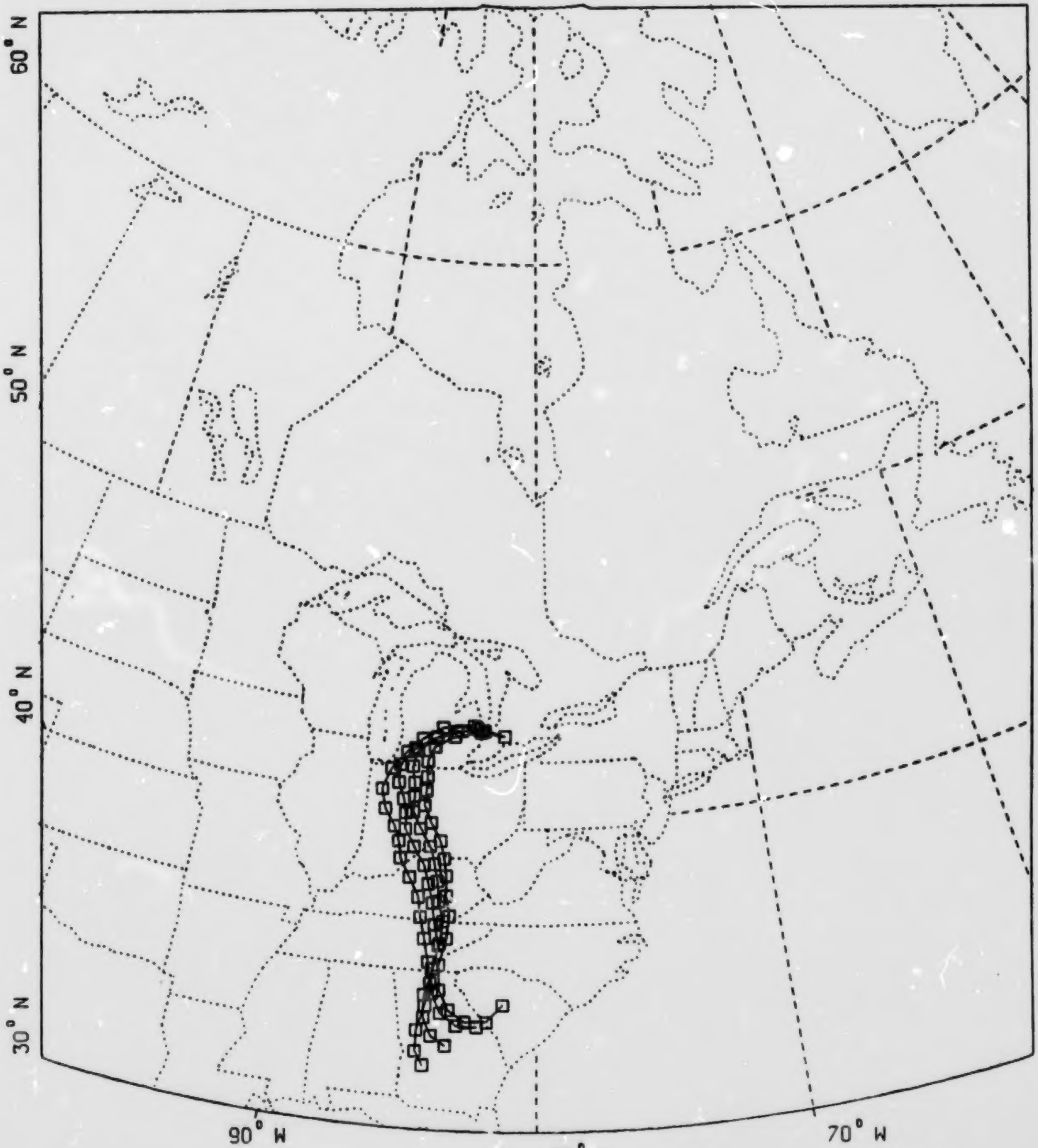

LOW
LOW
H
1028
1020
1012
1024
1020

Synoptic Surface Weather Map

7 a.m. EST on April 25, 1982

FIGURE 9 TYPICAL WEATHER PATTERN DURING OZONE EPISODES IN THE WINDSOR - QUEBEC CORRIDOR (WQC)

120 HOURS BACK-TRAJECTORIES
LONGWOODS OZONE EPISODE
JULY 1988 MONTHLY ANALYSIS
FROM 07/07/88 00Z TO 07/07/88 18Z BY 6HOURS INCREMENT
LEVEL
925MB □



60° N
50° N
40° N
30° N
90° W
80° W
70° W

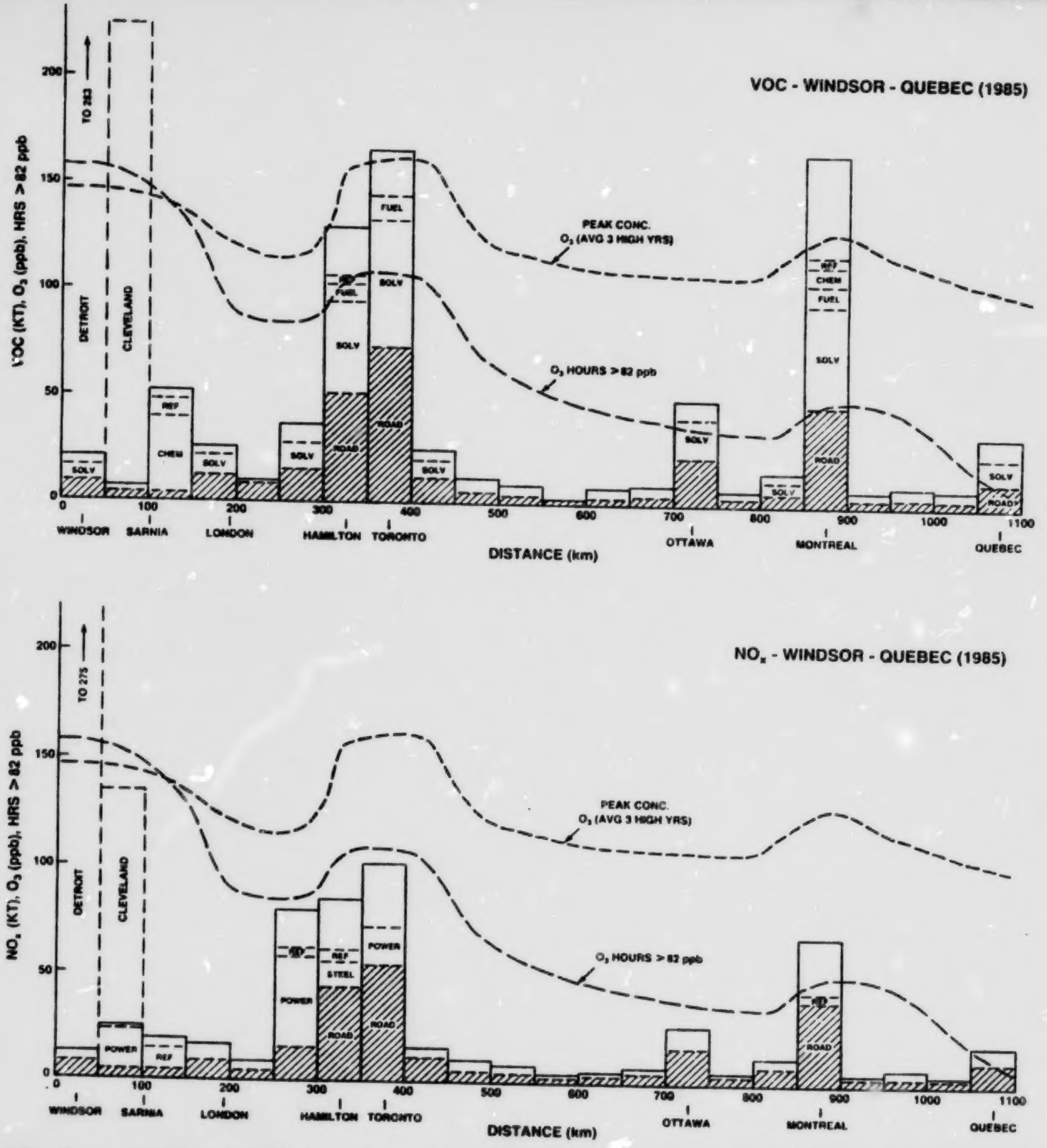


FIGURE 19 OZONE PROFILE AND NO_X/VOC EMISSIONS ALONG THE WINDSOR-QUEBEC CORRIDOR (WQC)

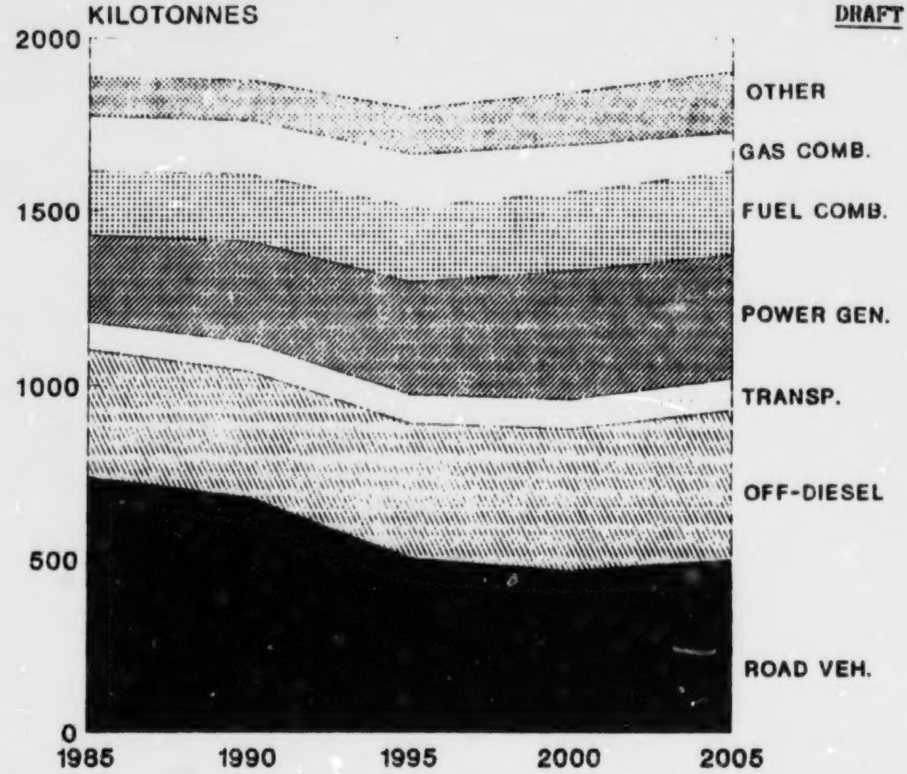


FIGURE 10 NATIONAL NO_x EMISSIONS PROJECTIONS - 1985 TO 2005

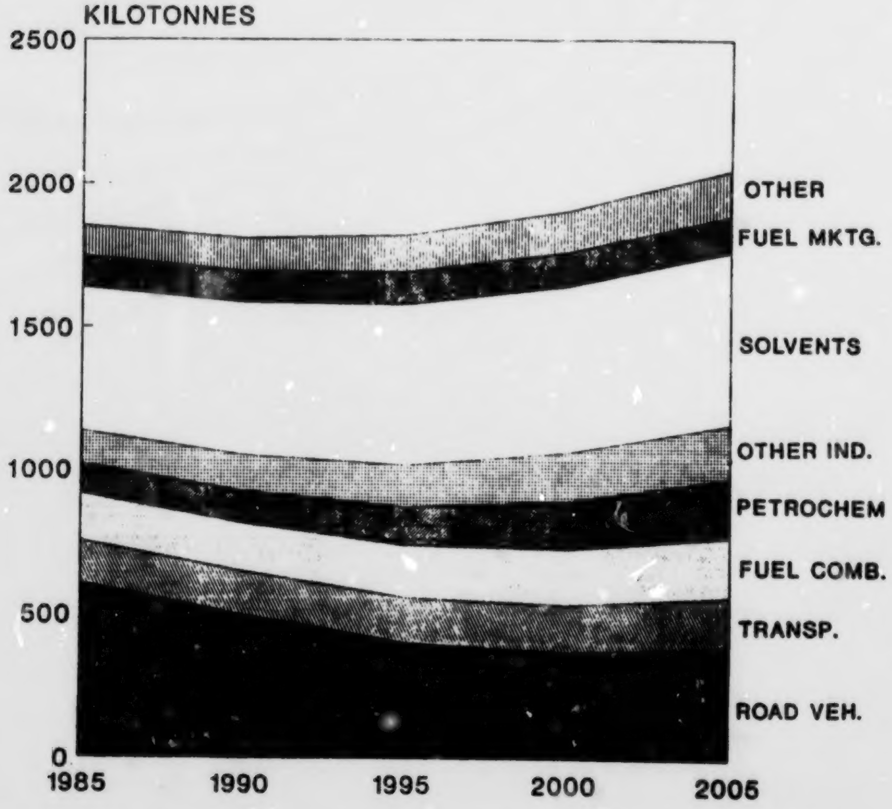


FIGURE 11 NATIONAL VOC EMISSIONS PROJECTIONS - 1985 - 2005

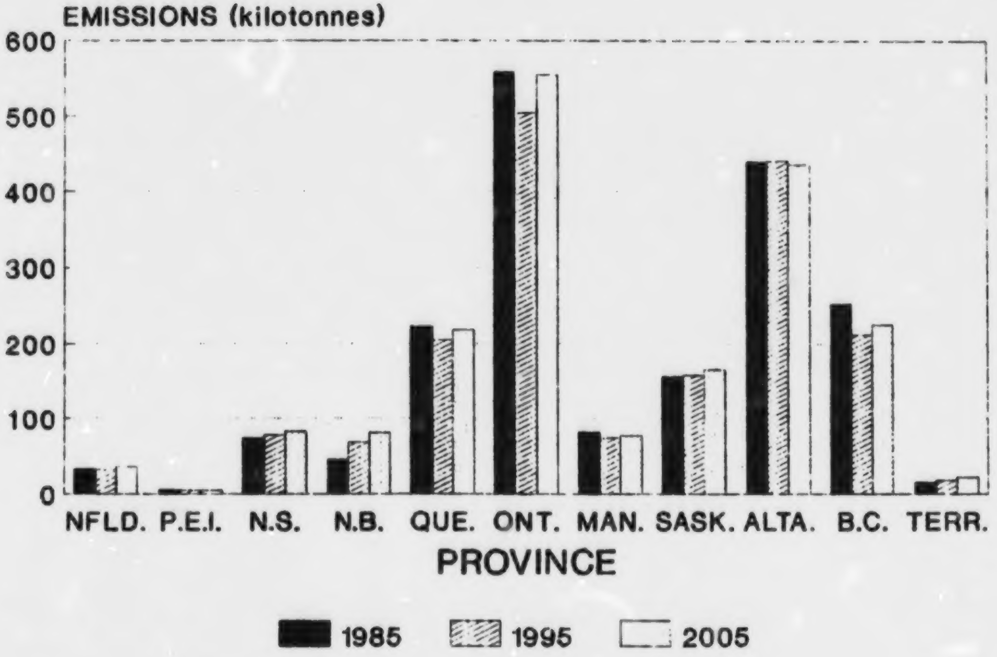


FIGURE 12 PROVINCIAL DISTRIBUTION OF NO_X EMISSIONS

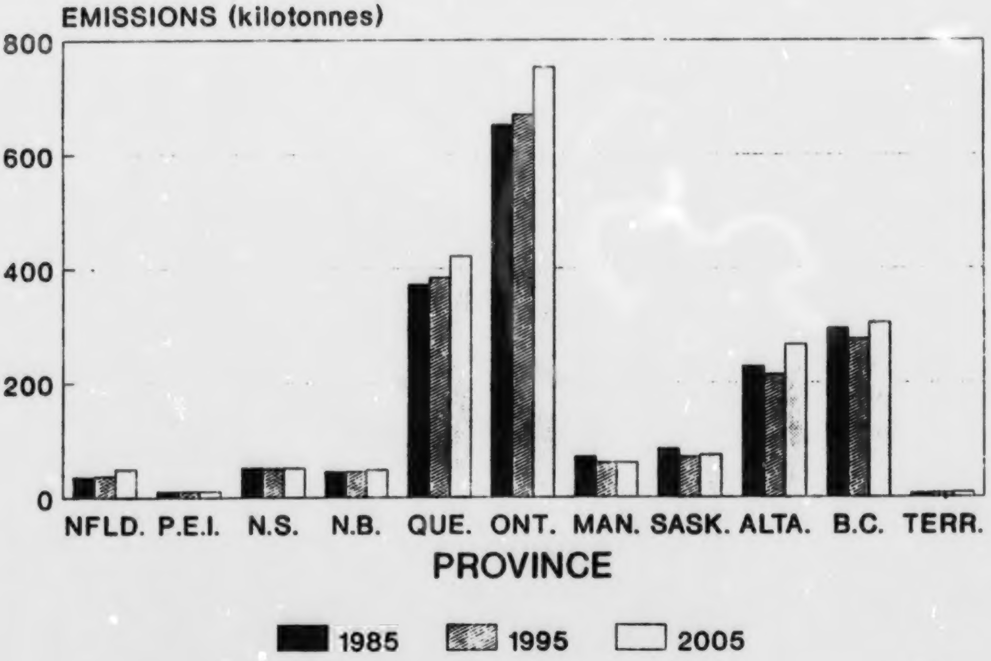


FIGURE 13 PROVINCIAL DISTRIBUTION OF VOC EMISSIONS

ESTIMATED OZONE REDUCTION NEEDED

REGION	O3 RED. NEEDED
LFV	> 40 %
WQC	
WINDSOR - OSHAWA	35 - 50 %
OSHAWA - QUEBEC CITY	30 - 40 %
SJA	30 %

ESTIMATED PRECURSOR REDUCTION NEEDED

REGION	REDUCTION NEEDED	
	VOC	NOx
LFV		
SCENARIO 1	50-60 %	0 %
SCENARIO 2	0 %	50-80 %
SCENARIO 3	40-50 %	40-60 %
WQC	50-75 %	50-75 %
	(Of combined Can. & U.S. emissions)	
SJA	UNDETERMINED (Major U.S. influence)	

90/05/15

ELEMENTS OF THE PLAN

A. NOx & VOC EMISSION CONTROL INITIATIVES

NATIONAL

ENERGY CONSERVATION & PRODUCT CONTROL	(N100, V100)
CONSUMER CHOICE & LIFESTYLE	(N200, V200)
SOURCE CONTROL	(N300, V300)

REGIONAL

ENERGY CONSERVATION & PRODUCT CONTROL	(N400, V400)
CONSUMER CHOICE & LIFESTYLE	(N500, V500)
SOURCE CONTROL	(N600, V600)

90/05/15

2

ELEMENTS OF THE PLAN (cont'd)

B. STUDIES FOR 2nd EDITION OF THE PLAN

EMISSION INVENTORY AND FORECASTS	(S100)
AMBIENT AIR QUALITY AND MODELLING	(S200)
TECHNOLOGIES, CONTROL OPTIONS, COSTS	(S300)
U.S. EMISSION CONTROL	(S400)

90/05/15

EMISSION CONTROL INITIATIVES

	NUMBER	REDUCTION (KT)
NOx		
NATIONAL	14	253
REGIONAL	9	71
TOTAL	23	324
VOCs		
NATIONAL	21	335
REGIONAL	17	209
TOTAL	38	544

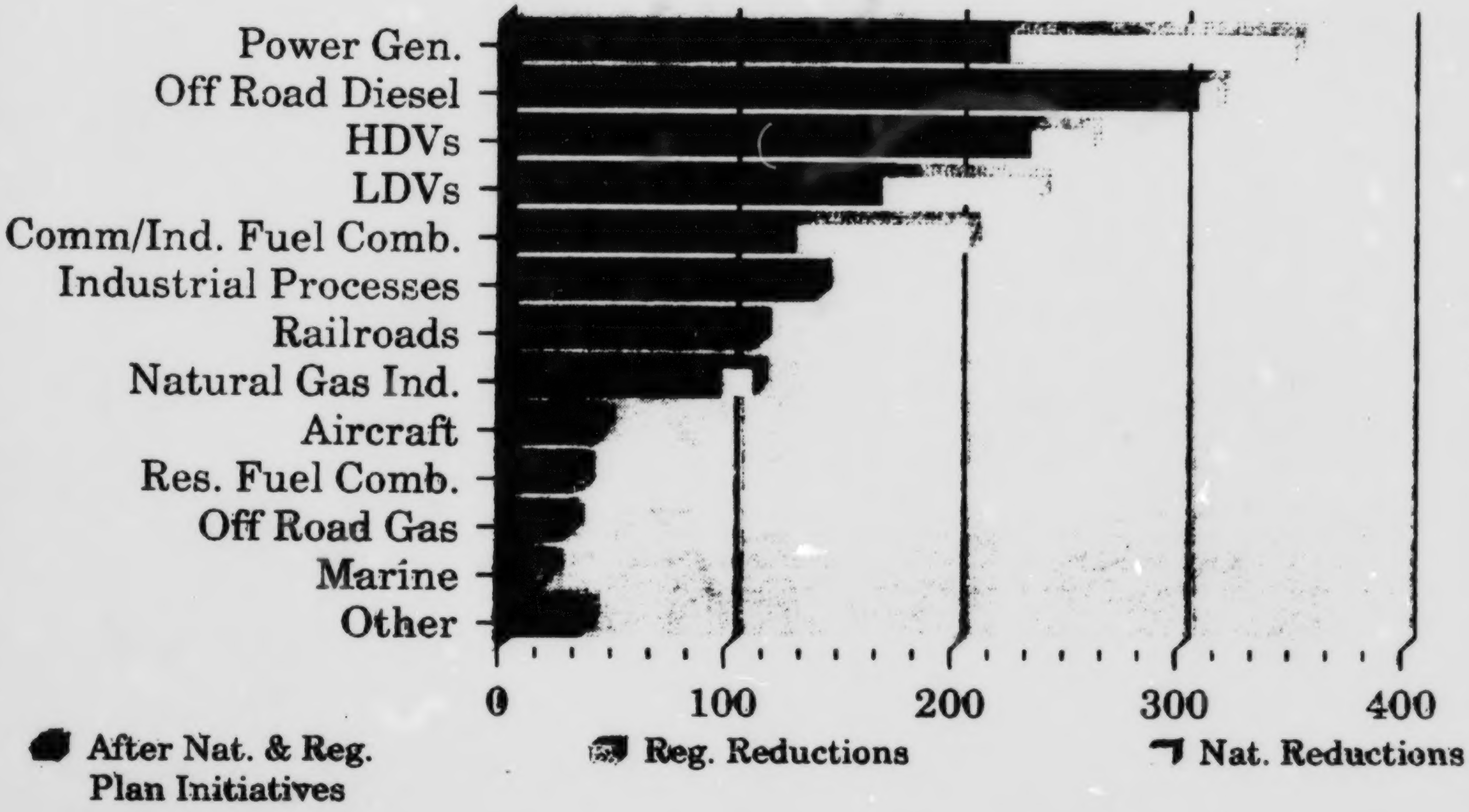
90/05/15

NOx EMISSION REDUCTION BY PROVINCE

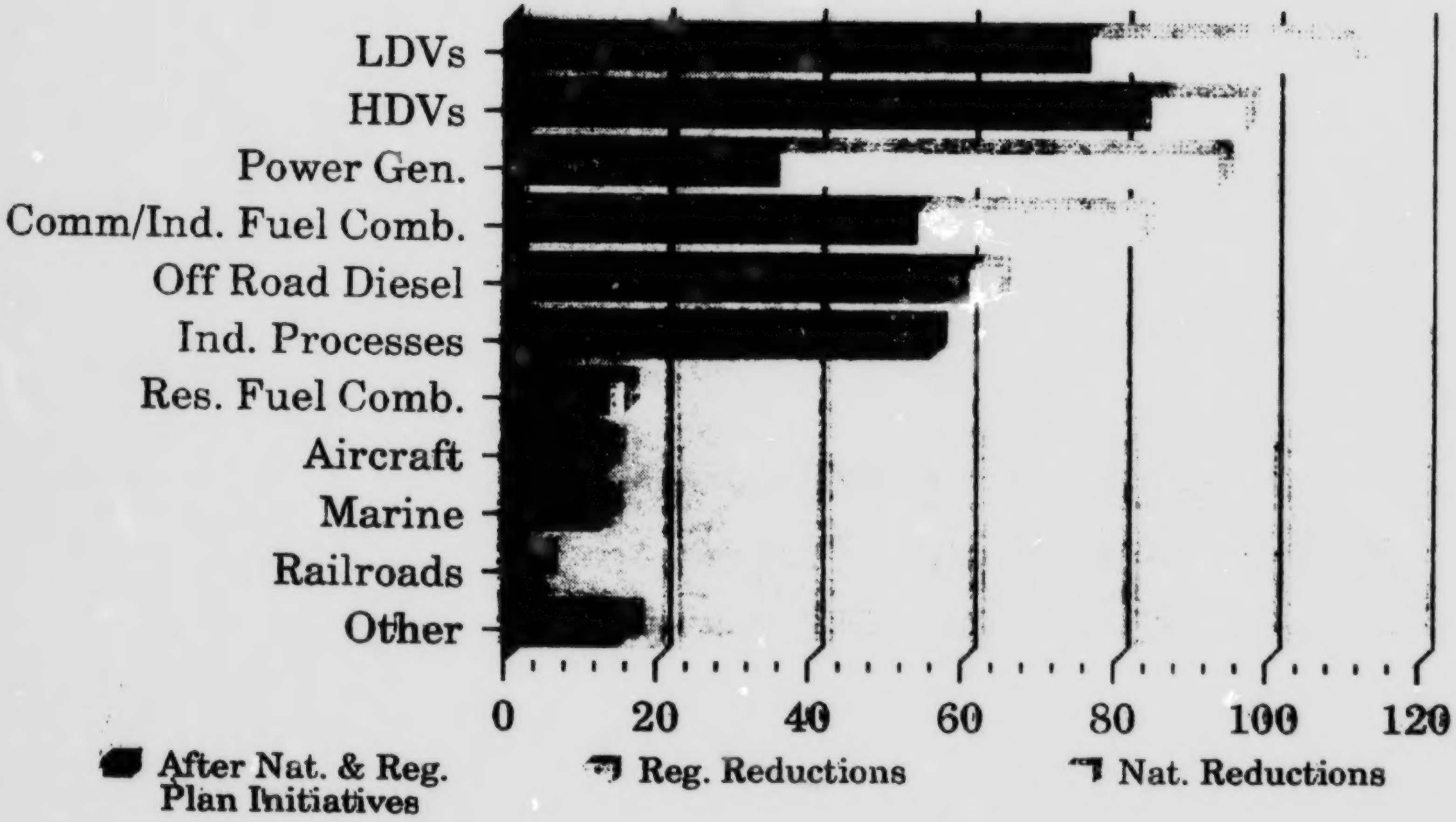
	% CHANGE FROM 1985	
BRITISH COLUMBIA	- 23.9	(LFV - 29.2)
ALBERTA	- 14.2	
SASKATCHEWAN	- 11.7	
MANITOBA	- 14.5	
ONTARIO	- 24.3	(WQC - 25.2)
QUEBEC	- 16.5	
NEW BRUNSWICK	- 36.2	(SJA + 79.2)
NOVA SCOTIA	- 1.2	
PRINCE EDWARD I.	- 16.1	
NEWFOUNDLAND	- 5.3	
YUKON / NWT	+ 25.6	
CANADA	- 16.3	

90/05/15

Pre–Plan & Post–Plan NO_x Emissions (Kt/Yr)
National–2005



Pre-Plan & Post-Plan NO_x Emissions (Kt/Yr)
Windsor-Quebec Corridor (W-Q)-2005

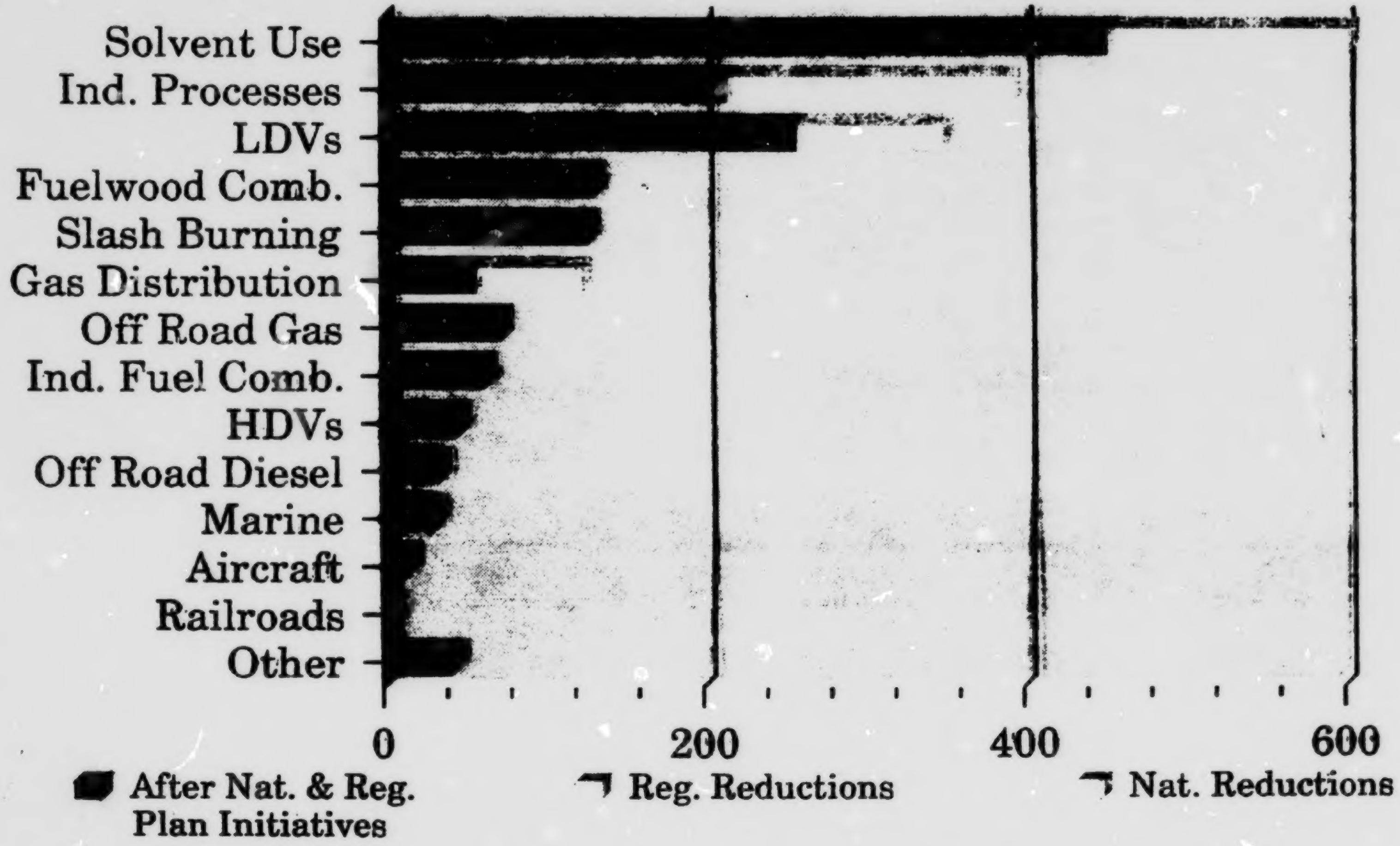


VOC EMISSION REDUCTION BY PROVINCE

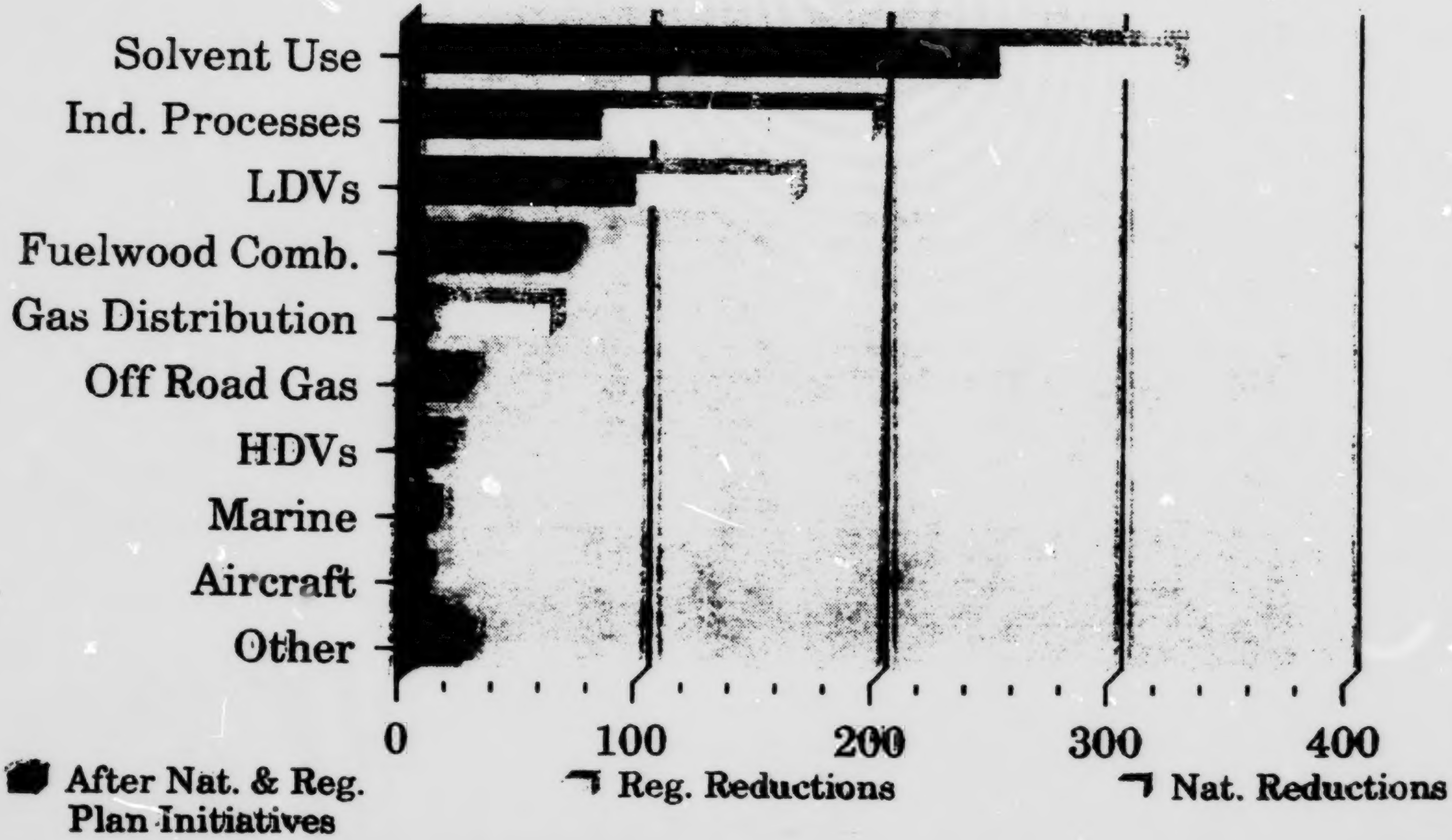
	% CHANGE FROM 1985	
BRITISH COLUMBIA	- 11.8	(LFV - 35.5)
ALBERTA	- 11.7	
SASKATCHEWAN	- 21.9	
MANITOBA	- 26.6	
ONTARIO	- 24.4	(WQC - 27.5)
QUEBEC	- 22.7	
NEW BRUNSWICK	- 14.8	(SJA + 25.7)
NOVA SCOTIA	- 23.0	
PRINCE EDWARD I.	- 9.1	
NEWFOUNDLAND	+ 26.7	
YUKON / NWT	+ 12.9	
CANADA	- 18.9	

90/05/15

Pre–Plan & Post–Plan VOC Emissions (Kt/Yr)
National–2005



Pre–Plan & Post–Plan VOC Emissions (Kt/Yr)
Windsor–Quebec Corridor (WQC)–2005



ESTIMATED REDUCTION IN OZONE

LOCATION	PLAN RED. IN PEAK (%)	PLAN RED. HRS › 82 PPB (%)
LFV		
- VANCOUVER	30	74
- CHILLIWACK	30	74
WQC		
- WINDSOR	0	0
- TORONTO	15	30
- STOUFFVILLE	15	40
- MONTREAL	20	55
- QUEBEC CITY	20	75
SJA		
- SAINT JOHN	15	100

COST OF THE PLAN

A. TO NOx / VOC EMITTERS

	$ M/YR in 2005 (1989 $)
NOx CONTROL 2005	278
VOC CONTROL 2005	350
TOTAL	628

B. TO DEVELOP / IMPLEMENT

- $90 MILLION (1989$) OVER 5 YEARS (1990-1995)

(EXCLUDING INDUSTRY "PARTICIPATION" COSTS)

90/05/15

OTHER BENEFITS OF PLAN

- REDUCTION IN TOXIC VOCs
  - 15 TO 60 % (selected VOC)
- REDUCTION IN CO2 EMISSIONS
  - 6 % BELOW PROJECTED 2005 LEVELS
- REDUCTION IN NOx/VOC TRANSPORT TO THE U.S.
  - 25 TO 35 % IN KEY AREAS
- CONSISTENCY WITH ECE NOx PROTOCOL CONDITIONS
  - FREEZE OF EMISSIONS MET
  - BAT REQ. FOR NEW SOURCES MET
  - CRITICAL LOAD - FIRST STEP
- ECE VOC PROTOCOL CONDITIONS
  - GUIDANCE FOR NEGOCIATIONS

90/05/16

SECOND EDITION OF THE PLAN

. TIMING

- BEGIN DISCUSSIONS LAST HALF OF 1993
- COMPLETE OCTOBER 1994

. OBJECTIVE

- FULLY RESOLVE NOx / VOC RELATED ENV. / HEALTH CONCERNS

90/05/15

SECOND EDITION OF THE PLAN (Cont'd)

. ACCOUNT FOR:

- NEW EMISSION FORECAST
- OXIDANT MODELLING RESULTS
- NEW INFO ON NOx/VOC SOURCES / CONTROL OPTIONS
- NEW TECHNOLOGY
- EFFECT OF NEW U.S. CONTROLS
- NEW ENV. / HEALTH CONCERNS
- CONDITIONS OF CAN. / U.S. AGREEMENT
- CRITICAL LOAD PROVISION - NOx PROTOCOL
- CONDITIONS VOC PROTOCOL
- GREENHOUSE GAS CONTROL PROGRAM

90/05/16

GLOBAL WARMING: TOWARDS A STRATEGY FOR ONTARIO

by

B. Yang, Cabinet Office, Government
of Ontario, Toronto

NATURE OF THE POLICY PROBLEM

CERTAINTY	Natural Heat Trap, "Greenhouse"
	Increment from Human Activities
	Rising Concentrations
↓	Magnitude and Rate of Warming
	Sea Level Rise
	Absorption, Buffer, Lags
	Weather Response
	Regional Impacts storms, soil dryness
	Economics prevention, mitigation, adaptation
UNCERTAINTY	Climate Change
GLOBAL IN NATURE	Need for Collective Action
	Fairness and Equity
	Difficulty of International Agreement

GREENHOUSE GASES

GAS	WEIGHTING (100 YRS)	LIFETIME	KNOWN SOURCES
carbon dioxide	1	long	yes
methane	21	short	qualitative
nitrous oxide	290	long	qualitiative
CFC 11	3500	long	yes
CFC 12	7300	long	yes
HCFC 22	1500	short	yes
surface ozone		short	yes

CARBON DIOXIDE EMISSIONS IN 1988 IN ONTARIO

SECTOR	megatonnes	per cent
Residential	19	11
Commercial	11	7
Industrial	50	30
Transportation	42	26
Energy Industry	10	6
Electricity Generation	32	20
	164	

1 kW.h, coal-fired = 1 kg

3500 MW, coal-fired = 23 megatonnes

auto = 5 tonnes

house = 7 tonnes

heavy truck = 246 tonnes

INTERNATIONAL CONTEXT

CONFERENCE ON THE CHANGING ATMOSPHERE, Toronto June 1988

- Elimination of CFCs by 2000
- Stabilization of concentrations of carbon dioxide
- Initial goal of 20% reduction from 1988 levels of emissions of carbon dioxide by 2005

UN IPCC

- Science, Impacts, Policy Response
- Geneva 1990
- Brazil 1992

TARGETS

- Norway 1989
- Netherlands 1989
- Ontario 1990
- United Kingdom 1990

GOOD INTENTIONS

- Victoria, New South Wales
- Sweden
- Oregon, Vermont
- Toronto

TOWARDS A STRATEGY FOR ONTARIO

ACCEPT SERIOUSNESS OF RISKS

ESTABLISH CONSULTATIVE PROCESSES

- Understanding
- Commitment
- Pressure of Peers

LEAD IN HELPING TO STABILIZE GLOBAL CONCENTRATIONS

INCLUDE ALL GREENHOUSE GASES

REDUCE EXPECTED EMISSIONS SO THAT LEVELS IN 2000 ARE LOWER THAN IN 1989

ACT NOW ON WHAT IS WORTH DOING IN ITS OWN RIGHT

- Cost-effective
- Market Failures
- Multiple Objectives

SHARE RESPONSIBILITY, ENABLE, EMPOWER

EXPAND RESEARCH AND ANALYSIS

MONITOR AND INFORM

ROLES AND RESPONSIBILITIES

GOVERNMENT

- Regulatory Framework
- Operations and Leadership by Example
- Public Information
- Inter-governmental Co-operation
- Partnerships
- R and D
- Impact and Risk Assessments
- Monitoring

UTILITIES

- Customer Service, Not Commodity
- Beyond Customer Satisfaction
- Demand Management
- Procurement
- Environmental Indicators
- Inspection and Regulation
- Getting the Price Signals and Discount Rates Right
- Sequestering Carbon

PRIVATE SECTOR

- Understanding of Role
- Efficiency and Competitiveness
- Partnerships

INDIVIDUALS

- Understanding of Roles
- Influence through Choices and ENGOs
- Pressure

EXAMPLES OF ACTIONS BY GOVERNMENT

Regulations Affecting New Buildings

Methane from Landfills

Rate of Return on Conservation Expenditures

Labelling for Greenhouse Gases

Recycling of CFCs

Non-commercial Tree Planting and Nurturing

Deeper Understanding

- Market-based Mechanisms
- Technology and Capital Stock Turnover
- Impacts and Risk Management

Development of a Vehicle-Related Emissions Program for Ontario

Emission Technology & Regulation Development Section
Air Resources Branch, Ontario Ministry of the Environment
Presented by: Terrance P. Stopps

INTRODUCTION

We all share concern about our environment and public awareness demands a cleaner environment. The nature of emissions from vehicle-related activities provide a case-in-point. Gasoline and diesel powered vehicles are associated with the emission of carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_x), and a toxic mixture of hydrocarbons (VOC or HC) and particulate.

In Canada (1985), an incredible 10.6 million tonnes of CO were emitted, from all types of sources. Over the same year, over 1.8 million tonnes of VOC and about 1.9 million tonnes of NO_x were emitted from anthropogenic sources.

Ontario shares this burden. In 1985, Ontario sources emitted a total of 2.66 million tonnes of CO (64% vehicle-related), 558 kilotonnes of NO_x (62% due to vehicular activities) and 653 kilotonnes of VOC (46% is vehicle-related). Benzene is exemplary of more toxic materials and 14,000 tonnes were emitted in Ontario (64% from vehicles/vehicle fuels). Table 1 shows the absolute emissions, where vehicle-related emission include all types of ground vehicles, excluding rail emissions and include emissions related to the distribution and marketing of gasoline fuels.

TABLE 1. Ontario Emissions (TOTAL and Vehicle-Related Sector)

Pollutant	Total	Vehicle-Related
CO	2,660	1,700
NOx	558	349
VOC	653	300
Benzene	14	9

Kilotonnes / Year (1985)

ENVIRONMENTAL CONCERNS

The environmental concerns associated with these emissions can be categorized into three general areas of concern:

Global Issues: Many of the compounds associated with vehicle emissions could contribute to a potential greenhouse effect. Exemplary of these VOC is butane; even O_3 itself is a potential greenhouse gas.

Regional Issues: One urban air problem that *is* on the mind of Canadians is ozone (O_3). We know that NO_x and some VOC react to form tropospheric (ground-level) O_3. Vehicles represent a major source of NO_x and VOC and are commonly perceived to be at the root of urban O_3 and smog. The three compounds can all generally be classified irritants and are associated with decreased lung function. In addition, the acid derivatives of NO_x are also known contribute to acid rain.

Local Issues: On a local level, the toxic component of the emissions may pose a health threat. The particulate associated with diesel emissions is known to carry polyaromatic hydrocarbons (PAH) probable human carcinogens and also the volatile compound benzene. These chemicals are all of concern when considering human risk of cancer. Other environmental health concerns also exist.

It was with many of these issues in mind, that the Ontario Ministry of the Environment has been in the process of developing a comprehensive program to address vehicle-related emissions. Some components of the proposed program could be implemented quickly, others in the intermediate-term and some clearly require additional study and development with a long-range goal.

MINISTRY PLAN FOR ACTION

The near and intermediate term actions that could be proposed by the Ministry include the following potential actions:

- Improved Vehicle Emission Controls
- Vehicle Inspection & Maintenance Programs (I&M)
- Improved control of Diesel Emissions
- Higher Environmental-Quality Fuels
- Fuel Distribution/Marketing Controls

In the first initiative has already been partly achieved. The Ministry has successfully encouraged the Federal Government to adopt more stringent controls for light-duty vehicle (LDV) emissions. In February, the Federal Government made its intentions known, through the Canada Gazette. California-style 1993 emission controls would be required, for all LDV. The Federal government will require that emissions be limited, for the 1994 model year and beyond, such that new vehicles emit no more than 0.25 g/km (0.4 g/mi) of NO_x, down 60% from 1988 standards; and 0.16 g/km (0.25 g/mi) of HC, reduced 29% from 1988 standards. Emission limits for carbon monoxide remained unchanged at 2.1 g/km (3.4 g/mi) of CO.

Programs with Ministry of Transportation Ontario

The Ministry of the Environment (MOE) has also proposed joint action, in conjunction with the Ministry of Transport Ontario (MTO). Should such a program be adopted, an expansion of the *Inspection on Re-sale* program would include a check of the integrity of emission control equipment.

Additional proposals, for intermediate-term implementation of regular inspection, testing and maintenance are now being developed, with MTO officials.

Programs with the OPP

The Ministry has also proposed joint activity with the Ontario Provincial Police that would, if adopted, lead to an enhancement of O.P.P. enforcement potential, regarding existing requirements of Section 57 (4) of the *Highway Traffic Act*, preventing the emission of excessive smoke.

In parallel with this initiative, MOE is studying ways to increase the stringency of provisions under the *Environmental Protection Act*, O.Reg. 311 and to enhance the requirements for the environmentally safe operation of LDV and to extend provisions to heavy duty vehicles (HDV).

ENVIRONMENTALLY SAFE FUELS

The quality of our vehicle fuels can have a dramatic impact on our environment, both in terms of direct evaporative emissions from vehicles or from fuel distribution and marketing; but also through the fate of the fuel and the combustion products released at the tailpipe.

Accordingly as a first measure, the Ministry has regulated the Reid vapour pressure (RVP) of summer gasoline. Over the last two years, the RVP of gasoline has been restricted to 72 kPa (10.5 psi). During other times of the year, gasoline volatility may legally be as high as 79 kPa (11.5 psi). The Air Resources Branch of the Ontario Ministry of the Environment is committed to an exploration of 62 kPa (9.0 psi) restrictions, for future summer gasolines.

At the same time, Ontario has begun to explore alternative fuels and has included reformulated gasoline in that consideration. Benzene is a component of all gasolines (approximately 2% by volume) and so the compound is found in the vapour arising directly from gasoline. However, evaporative emissions are not the only consideration, when examining the composition of gasoline. Tailpipe emissions are certainly affected by fuel composition. For example, according to California estimates, tailpipe emissions of benzene are composed of approximately one-to-one ratios of uncombusted benzene but also of newly formed benzene, likely formed from other the aromatic constituents of the fuel. Therefore, it will clearly be necessary to closely examine all constituents and their fate, when designing higher environmental-quality fuels.

Long-term considerations could include the use of ethanol, methanol and other sources of energy for propulsion.

VEHICLE FUEL DISTRIBUTION AND MARKETING

Direct evaporative emissions are not only influenced by the vapour pressure of the fuel, but also by the operating (handling) practices used during the distribution and marketing of the fuel. Figure 1 shows the components of the distribution system and illustrates the points where emissions of vapours are generated. During these activities approximately 41,600 tonnes of VOC are released each year and approximately 650 tonnes of benzene. The Ministry has proposed to immediately move toward the control of emissions, during the distribution of vehicle fuels and to aggressively study the implementation of controls during the re-fuelling of vehicles.

Figure 1. Vapour Emissions During the Distribution & Marketing of Vehicle Fuels.

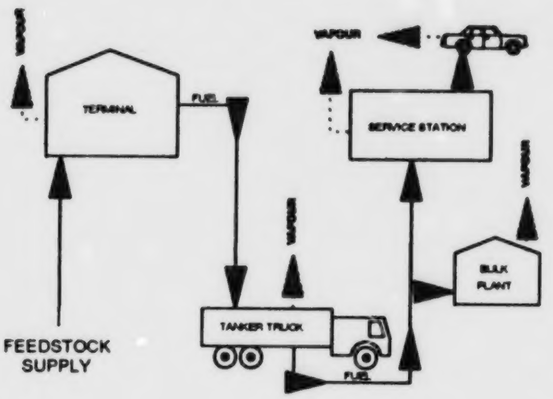
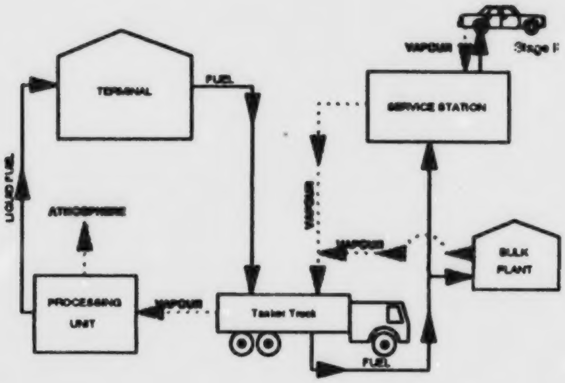


Figure 2 shows how vapours can be balanced or returned back to the terminal, then processed to recover the vapours (vapour destruction: usually thermal incineration can also be used to prevent the release of VOC. The term *Stage I* vapour recovery systems refers to the emission control activities related to the distribution or transfer of vehicle fuels. *Stage II* vapour control systems refers to the controls related to the marketing or re-fuelling of vehicle fuels.

Figure 2. Recovery of Vapours During the Distribution & Marketing of Vehicle Fuels.


VAPOUR
Stage I
TERMINAL
FUEL
SERVICE STATION
LIQUID FUEL
ATMOSPHERE
VAPOUR
VAPOUR
BULK PLANT
PROCESSING UNIT
VAPOUR
Tanker Truck
FUEL

Stage I Control Systems: The Ministry is considering a rapid development and implementation of a regulation on gasoline distribution. The regulation would be composed of 4 main mechanisms:

- Source Registration
- Certificates of Approval
- Control Technology
- Performance Monitoring

Facilities: Such a program would be a major under-taking, involving the regulation of 15 major distribution terminals, 533 bulk plants, 7,160 retail gasoline outlets and several thousand private facilities. In addition, 1,309 large tank truck units and up to 1,585 smaller vehicles may be involved.

The large facilities are found primarily in the high population density areas of the Province. Of the 15 terminals, six are found in greater Toronto, three in Hamilton, three in Ottawa and one each in London, Nanticoke and Sarnia. Other facilities also generally follow the pattern exhibited by the population.

IMPLEMENTATION OF FUELS DISTRIBUTION REGULATION

Geographic Phasing: Given the size and nature of the undertaking it would likely become necessary to plan the implementation of this regulation, by phases. One senario might be:

- Golden Horseshoe - 2 years
- 401 Corridor - 3 years
- All Ontario - 4 years

Other implementation plans could be considered.

Cost to Industry: All environmental control programs have a cost. For this potential case, the Ministry has estimated the capital cost to industry at $86 million. Gross annual costs would be valued at $16 million, attenuated by the value of recovered fuel to $6 million, over the same period. If such a regulation was adopted, these costs would be distributed amidst three major industry players: the Ontario Petroleum Association, Independent Oil and Trucking Companies.

Economic Implications: It is recognized that many of these costs would ultimately be bourne by the consumer as gasoline prices increase by a modest 0.05 cents per litre per year, over a ten-year write-off period. However, some potential economic benefits could ensue. Labour would be a major part of the economic costs and so employment income of $77 million would be generated together with some 1,700 person years of employment.

SUMMARY AND CONCLUSIONS

The effect the reduction of vehicle-related air pollution, Ontario is considering the adoption of a program consisting of four or more potential parts:

- Vehicle Emission Controls
- Vehicle I & M Programs
- Higher Environmental-Quality Fuels
- Fuel Distribution/Marketing Controls

Significant reductions of sector emissions would be expected following the adoption these or similar programs. Table 2 shows the reductions that would be associated with these potential programs, referenced to 1985 emission levels.

Table 2. Emission Reductions Associated With MOE Vehicle-Related Programs.

Sector	NOx	VOC	CO	Benzene
Vehicles	15	22	3.1	?
Fuel Distr/Market	-	90	-	89
TOTAL SOURCE	9	14	1.7	4

However, the table also shows the modest effect of a potential vehicle-related emissions compared to total emissions, from all sources. This underscores the need for the development of integrated programs, that reduce emissions from a variety of sectors and activities. Therefore, the Ministry is working the development of a broad-range of programs to further control stationary source and mobile emissions.

FUTURE PROGRAMS

One such major parallel initiative is called the Clean Air Program (CAP). Other intermediate and long-term initiatives, for both mobile and stationary sources will help provide additional reductions, as we move toward a cleaner air resource, for Ontario.

SESSION III WASTE MANAGEMENT

Moderator: Robert J. Redhead
Director of Government Relations
Laidlaw Inc., Burlington, Ontario

John Farrow, Acting Chief Administrative Officer
Solid Waste Interim Steering Committee
Toronto, Ontario

L. MacMillan, Gore & Storrie Limited
Mississauga, Ontario

B. Fenoulhet, Development Supervisor
Ontario Ministry of Northern Development and Mines
Toronto, Ontario

D. White
Proctor and Redfern Ltd.
Consulting Engineers and Planners
Hamilton, Ontario

Paul L. Hansen, Chrysler Canada Ltd.
Windsor, Ontario

GREATER TORONTO AREA WASTE MANAGEMENT ACTIVITIES

by
John Farrow, Acting Chief Administrative Officer, Solid Waste Interim Steering Committee, Toronto, Ontario

Two parts - first about SWISC, second about some of the lessons learned to date.

> **"Environmentalism is the demand for more goods and services (clean air, water and land) that does not differ from other consumption demands except that it can only be achieved collectively."**
>
> **Lester Thurow, 1980**

PART 1

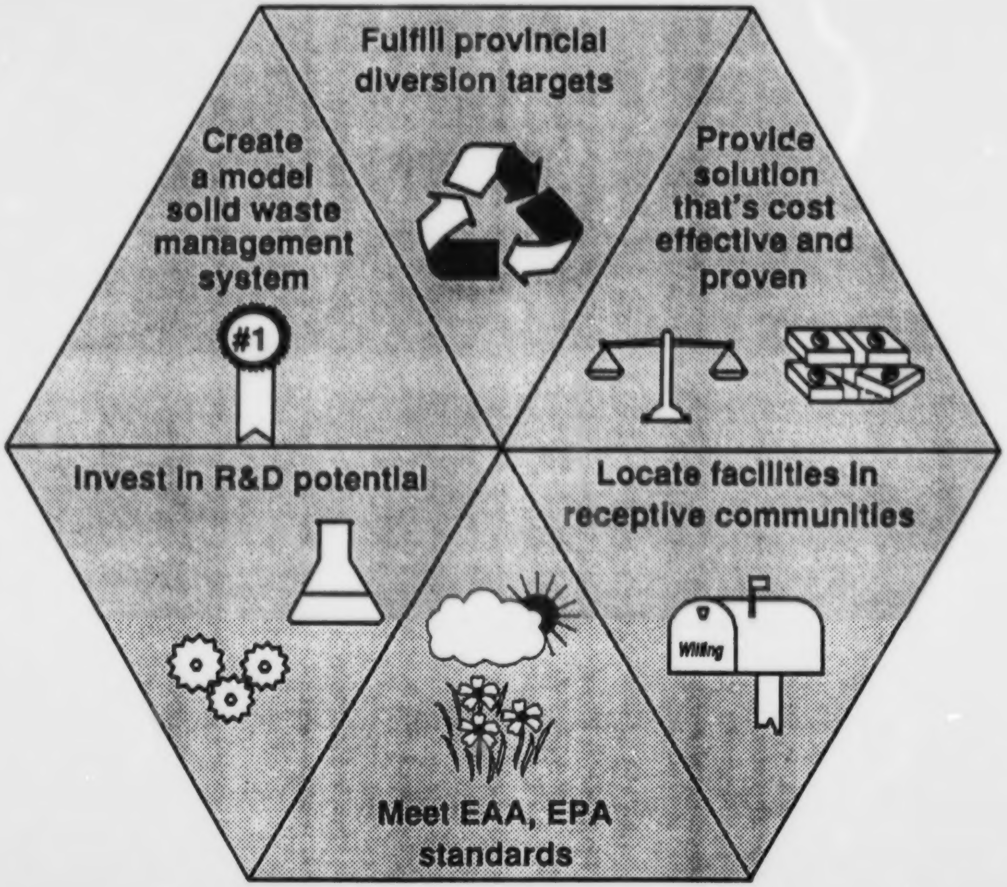
1. **SWISC's origins and operating guidelines (slide 1)**
2. **SWISC's principles (slide 2)**
3. **What we learned from the EOI's**
    - **Target is right**
    - **It will be a stretch**
    - **Innovation requires risk and an approach that recognizes these risks.**
4. **Four-part approach (slide 3)**

THE CHALLENGE FACING SWISC IS A DEMANDING ONE

"Through a collaborative approach, SWISC will develop and implement a system for managing the solid wastes of the GTA which is technically, environmentally, socially and economically sound."

ZBT-VROH4

SWISC IS COMMITTED TO THE REALIZATION OF ITS PRINCIPLES



Fulfill provincial diversion targets

Create a model solid waste management system

Provide solution that's cost effective and proven

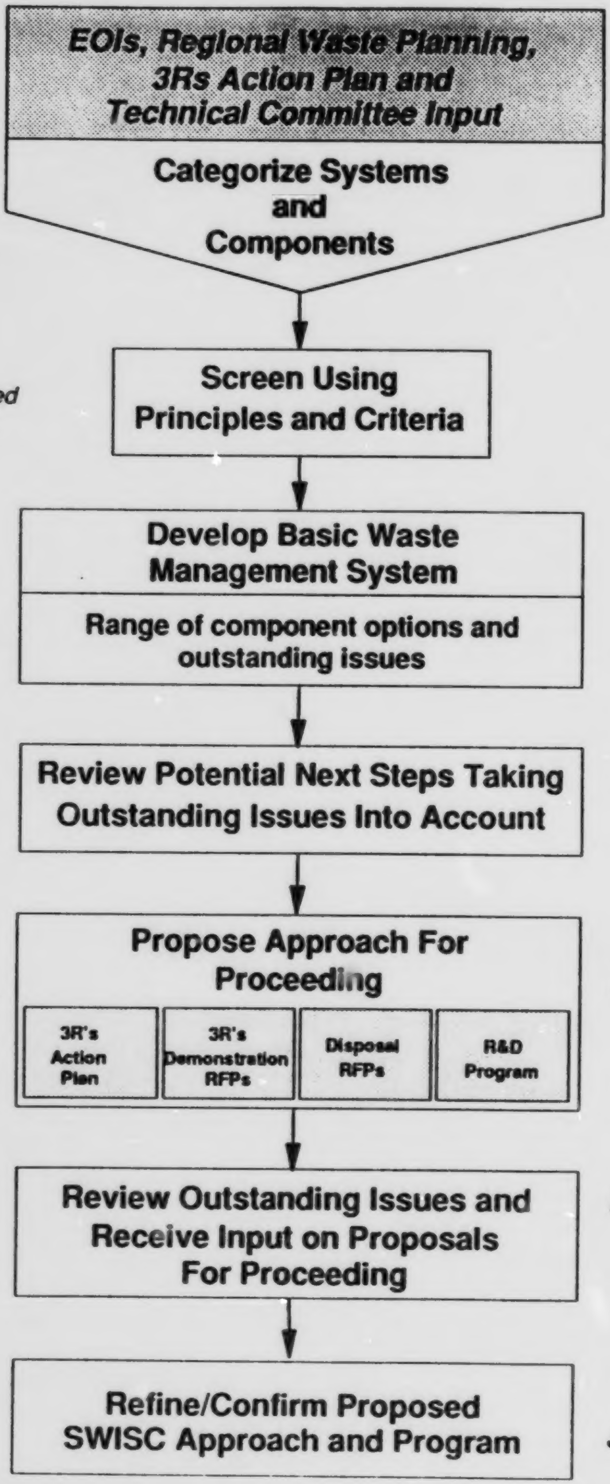
Invest in R&D potential

Locate facilities in receptive communities

Meet EAA, EPA standards

ZBT-VROHS

EVALUATION PROCESS AND PROPOSED APPROACH FOR PROCEEDING



• *Inputs to EOI evaluation process*	***EOIs, Regional Waste Planning, 3Rs Action Plan and Technical Committee Input***	
• *EOIs were categorized into systems, partial systems and components*	**Categorize Systems and Components**	
• *Systems, partial systems and components were screened to determine potential system and component options*	**Screen Using Principles and Criteria**	
• *Outstanding issues were documented*	**Develop Basic Waste Management System** **Range of component options and outstanding issues**	
• *Potential management, planning and technical considerations were applied to determine next steps*	**Review Potential Next Steps Taking Outstanding Issues Into Account**	
• *SWISC releases Status Report and associated documents*	**Propose Approach For Proceeding** **3R's Action Plan** **3R's Demonstration RFPs** **Disposal RFPs** **R&D Program**	**April 6, 1990**
• *Receive input from public and SWISC Member Councils*	**Review Outstanding Issues and Receive Input on Proposals For Proceeding**	**April - June, 1990**
• *SWISC considers its future program based on input*	**Refine/Confirm Proposed SWISC Approach and Program**	**July 1990**

PART II -LESSONS LEARNED

1. Waste is unlike other public goods (slide 4).
    - Its genesis is a long way from its most severe impacts.
    - Therefore, capacity restraints don't work.
    - Heavy-handed solutions can have unforeseen results.
    - We need to pull the waste out of the waste stream, not push it, otherwise it will pop out somewhere else.

2. We do not pay enough attention to how regulations actually work.

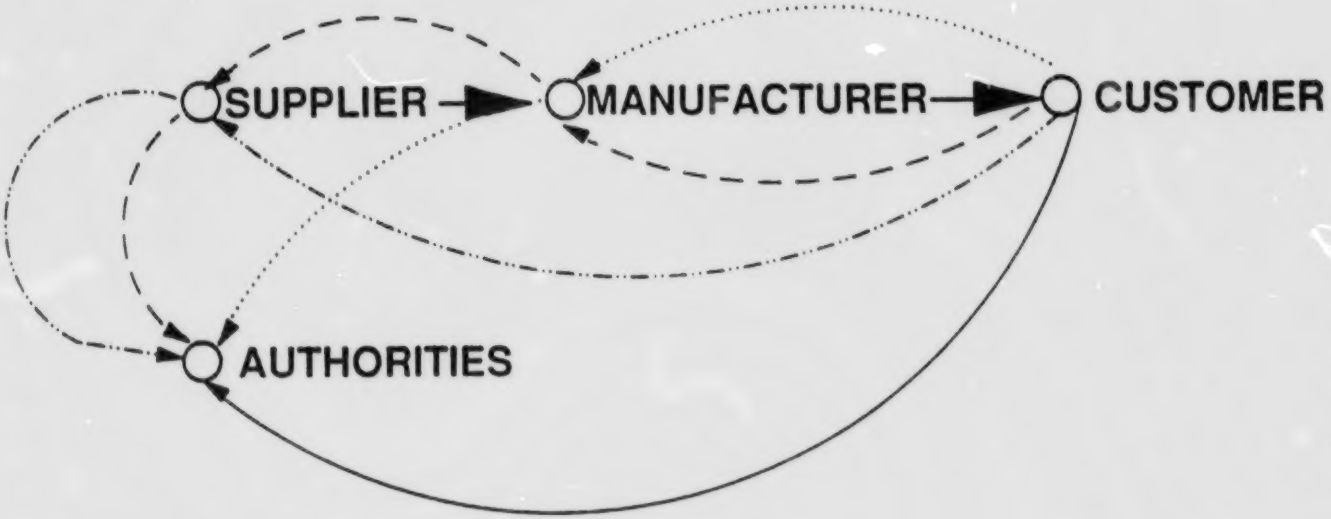
"If you have ten thousand regulations you destroy all respect for the law."

Winston Churchill, 1931

(a) The regulators:
- Interpretation
- Problem identification
- Training
- Revisions.

(New plant analogy)

Which is the most efficient Waste Management Chain?


SUPPLIER
MANUFACTURER
CUSTOMER
AUTHORITIES

(b) The regulated - slow to recognize strategic implications:
- Staffing
- Training
- Risk mitigation strategies
- Changes in the environment require changes to the organization.

When we are looking to achieve changes through regulation we should be looking to changes in budget and organizations. Where these don't occur, there is a crisis coming.

3. 50% diversion will require a major shift in behaviour.

This change in behaviour is required by the public including retailers and government. Achieving this change will require investment in advertising, education and training.

As one participant in a workshop said, "How can I get my colleagues to put trash in the right can, they won't do other things right."

There is a need to:

(a) Invest money to achieve this behaviourial change and

(b) Establish new relationships with those in the private sector who have the skills and relationships to get products re-used and re-cycled.

With a current tipping fee of approximately $100/tonne, even if Metro's proposed education/reduction program achieved 10% reduction, the investment in education of $10 million would be more than justified and would be paid back in less than one year.

4. There is an on-going need for innovation.

One of the disappointments is the low level of innovation. The low level of innovation is the result of four factors:

- An uncertain regulatory environment
- Therefore, a low level of investment
- Low tolerance for risk and
- Barriers to knowledge transfer.

Permanent organization with a long-term mandate is required to foster this innovation.

5. New Joint Ventures must keep politicians in the loop.
   - At SWISC there are regular technical and political meetings.
   - Issues are addressed at both the technical and political level.
   - Cooperative action requires trade-offs - such trade-offs are difficult to make at the staff level.

Political involvement helps the joint venture to evolve and develop.

6. The Provincial targets for diversion seem about right.
   - Manufacturers ask if I am recommending change
   - I acknowledge that we are reaching
   - However, if they had been clearly reachable, innovation would not have been stimulated
   - When we have met these targets, new targets will be in order

In summary, solid waste management is changing. Waste management departments of the future will be:

(a) More complex - process technologies.

(b) More commercial - concerned with joint ventures - public/private, lots of different contracts, watching markets, constantly renegotiating, etc.

(c) Constantly changing as shifting markets, new technologies and changing behaviours require adaptation.

Waste will be exciting - Good luck.

A CO-OPERATIVE APPROACH TO WASTE MANAGEMENT PLANNING IN THE REGIONAL MUNICIPALITY OF NIAGARA

by

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HISTORY OF THE PLAN

The Regional Municipality of Niagara Act, Bill 170, does not assign the responsibility for the collection and disposal of waste to the Region. That responsibility rests instead with the area municipalities. In September 1982, the Region, under Section 178 (2) of the Act, with the support of the area municipalities and the Ministry of the Environment, initiated the preparation of a Waste Management Plan.

Technical studies leading to the development of the Plan were carried out by a consortium of consultants, led by Gore and Storrie Limited. The consultants were guided by a Steering Committee comprised of representatives from Regional Council, Regional staff, area municipalities, Ontario Ministry of the Environment and the Ontario Ministry of Energy.

In addition, during the course of the study a Public Advisory Committe was formed. The membership was drawn from the general public and PAC had two representatives on the Steering Committee.

The Plan was developed through the preparation and review of three major documents. Review comments were provided by the municipalities, the public and other Governmental agencies.

Stage 1

In December 1982, the Stage 1 Report was released. The Report provided estimates of current and future quantities of solid waste generated within Niagara, identified solid waste disposal systems in use, their costs and remaining landfill site capacities. Through the use of constraint mapping the Stage 1 Report identified areas within Niagara with environmental conditions that might be suitable for siting future waste disposal facilities.

Stage 2

In April 1984 the Stage 2 Report was released. Eighteen waste management systems, determined by the Consultants as applicable to Niagara, were examined and ranked considering the following criteria: economics, financial risk, degree that the system met public expectation, ease of implementation, and local impact.

Based on a review of the eighteen waste management systems by the Councils of the municipalities and the public, Regional Council agreed that three waste management systems would be subjected to a more detailed analysis in Stage 3.

Stage 3

In August 1986, the Draft Stage 3 Report was released. The Stage 3 Report provided a detailed evaluation of the three waste management systems, as identified previously by Regional Council. The three systems were subjected to analysis under the following criteria:

- Community Considerations
- Technical Considerations
- Economic and Financial Considerations
- Administrative Considerations

The Systems were also ranked by the Consultant.

The Draft Stage 3 Report was circulated to the municipalities, the Public Advisory Committee and all parties who requested it. Presentations outlining the contents of the Draft Stage 3 Report were made to the Councils and or Standing Committees of all the municipalities. During these presentations, it was emphasized that the Report contained the Consultant's recommendations. Responses were solicited from all parties.

In addition, during February 1987, a Conference was held at the Regional Municipal Building to review and discuss the contents of the Draft Stage 3 Report. Approximately 125 people attended.

Based on a review of the comments received from the Councils of the area municipalities, the public, and other governmental agencies, the Waste Management Plan based on the preferred System was finalized.

It should be noted that the level of analysis and screening of alternatives did not meet the requirements of the Environmental Assessment Act.

THE PLAN

The Waste Management Plan has a number of salient features:

1. Management of Waste

Firstly, The Plan recommends that the management of waste continue to be the responsibility of the municipalities by way of Boards of Management. The Plan, however, does not preclude the creation of new arrangements for the responsibility of this activity, provided these arrangements are consistent with the overall direction of the Plan.

2. Reducing the Amount of Waste to be Disposed

Secondly, consistent with policies of the MOE, it is urged that efforts be made to reduce the quantity of waste requiring disposal through:

- Undertaking public education and participation programs to increase awareness of the need to reduce the quantity of waste generated.

- Maximization of the quantity of waste diverted from waste disposal sites through implementation of source separation and recycling programs, such as the "Blue Box" programs presently underway in most municipalities and special household hazardous waste collection programs.

- Maximization of the quantity of waste diverted from waste disposal sites through the use of resource recovery facilities which may be similar to that previously operated by Cole Resource Recovery at the Glenridge Quarry site, when they are environmentally acceptable and economically practical.

- Investigation and implementation of other forms of resource recovery such as energy from waste, composting or refuse derived fuel, provided these are environmentally acceptable and economically practical, as technology and circumstances permit.

3. Landfilling

Thirdly, after a careful evaluation of waste management systems applicable in Niagara, the Plan concludes that the sanitary landfilling will continue to be necessary for waste requiring disposal which cannot be recycled or otherwise reduced in quantity.

The ultimate objective of the Plan is the reduction in the number of waste disposal sites through the establishment of Boards of Management whose members will jointly share common waste disposal facilities. It is proposed that over time, only three major waste disposal sites will be required to serve Niagara.

4. Collection of Municipal Solid Waste

Fourthly, The Plan recommends that the collection of municipal solid waste continue to be the responsibility of the area municipalities. The Plan, however, does not preclude the creation of new arrangements for the responsibility for this activity.

5. Maximizing Site Usefulness

The Plan recommends that existing and new waste disposal sites be organized and operated to allow for the disposal of all municipally generated waste. The Plan therefore, provides for the temporary storage of municipally generated digested sewage treatment plant sludges for disposal on agricultural lands, or disposal at the site, if necessary, with Ministry of Environment approval of such activity.

The Plan recommends that where an existing waste disposal site is operating in a environmentally acceptable manner, it should continue to be used to its approved capacity. It should not be prematurely terminated by a time scheduled closure.

The Plan supports extensions to existing sites where these can be proven to be environmentally sound.

ADMINISTRATION OF THE PLAN

The Plan recommends that administration of waste management be the responsibility of the municipalities, acting through Boards of Management. One Board, which has been functioning since 1971, will continue to include Grimsby, Lincoln, Pelham and West Lincoln. Another could include Fort Erie, Port Colborne, Welland and Wainfleet. A third could include Niagara Falls, Niagara-on-the-Lake, Thorold and St. Catharines. The Plan does not preclude the creation of other arrangements of municipalities in Boards provided these are consistent with the overall direction of the Plan. Boards of two or more municipalities would be supported when it is demonstrated they are an interim arrangement in a program to reach the ultimate objective of the Plan.

The above arrangements are consistent with the direction of the Plan to reduce the number of waste disposal sites serving Niagara, yet utilize to the best advantage the resources and experience which presently exist from ongoing municipal activities in waste management in Niagara. In light of the time required to establish a new site, it is recommended that discussion commence without delay regarding the formation of additional Boards. The Boards are to be established by legal agreements between the member municipalities.

The Plan recommends that a common accounting and operating procedure be adopted by each Board to allow comparison of costs, thereby facilitating information exchange.

Where work has not already progressed significantly leading towards an application for a Certificate of Approval for a new waste disposal site, or the expansion of an existing site, the Plan recommends that such work and the Ministry of the Environment certificates be structured to permit, at the discretion of the municipality or Board, the disposal of waste from all other municipalities, Boards and the Region at the proposed site. The Certificate of Approval does not require the acceptance of waste from another municipality, but allows it. The Board or the municipality still retains the right to accept waste from others and to state the conditions under which it will do so.

Efficient management of waste should not be constrained by municipal boundaries.

The Plan recommends that the waste disposal sites in Niagara will,, at all times, be operated utilizing the best established technology available, state-of-the-art methodologies, procedures and devices, to maximize the resource, safeguard the environment and minimize costs. Details such as scales, site entry, observation wells, proper monitoring, recording of activities, perpetual care, final end use of site and general benefit to the community, will be reviewed as part of the detailed operation plans.

At the present, the Region does not provide facilities for the purpose of receiving and disposing of wastes. However, the Region may comment on proposed undertakings of the municipalities and others related to the disposal of waste if it deems that such undertakings are not in concert with the Plan and/or on the specific request by the proponent.

The Region made a standing offer of assistance in the formation of Boards. The Regional Municipality of Niagara Act also allows the Region to enter into an agreement with an area municipality for waste management activities.

LONG RANGE CONSIDERATIONS

It is the responsibility of each area municipality or Board to continually monitor the remaining life of each site and to locate replacement sites or facilities for future use consistent with the Plan.

The Plan is to be updated every five to ten years to ensure that changes to waste generation and collection, impacts of new technologies, changes in jurisdiction and legislation, and the successes and or failures of the Plan, are addressed.

IMPLEMENTATION OF THE PLAN

The Plan recommends that there be flexibility in its implementation so that the municipalities ares not tied to rigid and unacceptable timetables which require them to abandon existing waste disposal sites prematurely.

It is recognized that an environmentally sound waste disposal site is an important municipal asset and to make less than full use of a waste disposal site will result in unnecessary costs to the taxpayer.

The Plan is currently being considered in the Five Year Review of the Regional Policy Plan. Appropriate policies will be included to supplement or replace those policies presently in the Policy Plan. Generally suitable areas in which future waste disposal sites may be located will be identified in the Policy Plan of the Region where supportable and beneficial. Official plans and zoning bylaws of the area municipalities also should include appropriate waste management policies.

Each Board is expected to prepare a detailed operational plan for its area of jurisdiction that complements the Regional Plan. These Board plans, which are to be consistent with the direction of the Regional Plan, are to go into more detail regarding local disposal and collection policies and practices as well as the 3 R's initiatives.

Since the adoption of the Regional Plan, one year ago, a Board of Management has been created between Fort Erie and Port Colborne. Another Board has been created between the Township of Wainfleet and the City of Welland. In each of these cases the formal agreements have been executed. A Waste Management Plan specific to each Board is now under preparation by Consultants.

As stated earlier the Board of Management for Grimsby, Lincoln, Pelham and West Lincoln has been functioning since 1971. That Board has operated a sanitary landfill site since that time and is currently seeking approvals for another site.

Niagara Falls, Niagara-on-the-Lake, Thorold and St. Catharines are in the process of forming their Board of Management.

In the Regional Municipality of Niagara a Co-operative Approach to Waste Management Planning appears to be heading toward the successful implementation of Waste Management Facilities.

ENVIRONMENTAL IMPLICATIONS OF ONTARIO'S NEW MINING LEGISLATION

by

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Let me start by asking how many of you know what a mine is? For those that don't know, a mine is a hole in the ground, whether open pit (like a quarry) or underground where a shaft is sunk, so that miners can access the orebody and extract the valuable minerals.

Prospectors explore for minerals by first doing some non-destructive exploration, such as air-borne geophysical surveys of the electro-magnetic or gravitational characteristics of the ground beneath; or walking the area and examining any rock exposures or by taking soil samples and performing geo-chemical assays of trace elements that are known to be indicators of underlying mineralization. If something positive is found, an area is staked according to the laid-down rules in the Mining Act and the prospector is then entitled, i.e. cannot be denied, to a claim of the mining rights, and also surface rights, if available. If a specified amount of work is performed on the claim, the prospector may "bring it to lease". Again, this is an entitlement and cannot be denied, if the requisite work has been done. Mining production is permitted on leased ground. If the lease area produces for a year, the leaseholder is entitled to a patent or freeholding of the mining rights and owns them outright.

Ore is hardly ever 100% mineral, so when the ore is brought to surface, a process occurs to separate the desired material from the undesirable. The latter is usually discarded and known as "tailings". Additionally, there is often waste rock from excavation and both can cause an environmental problem, which we'll look at later.

Another problem is subsidence. Imagine coming in the morning to start the shuttle busses for the Kidd Creek Mine and finding them at the bottom of a big hole! Or the truck trailer parked overnight that had sunken up to its axles!

Again, a lady driving in downtown Cobalt a couple of years ago stopped to investigate a pothole she had just struck. To her amazement, she could see no bottom to it, so she informed the police. They closed the road because it turned out to be a 240 foot deep hole! Both of these cases arose from old mine workings that had deteriorated after abandonment.

These and similar incidents gave rise to the Abandoned Mines Hazards Inter-Ministerial Committee to evolve a program for repairing the dangerous legacy of past mining activities. At the same time, thinking was being directed at "how to prevent" mechanisms.

Mining companies of fifty years ago, along with most industry, the government and the public, had considered the environment only from a very limited point of view: The plant environment's effect on workers and any rudimentary protection needed to maintain production. In general, effluents were ignored and, when the effect on the environment became a concern, were treated on the premise that dilution was the solution to pollution. And nobody worried about dumping tailings in the wilderness. No laws existed to control pollution - nobody or very few understood that tailings could produce the acid that is considered a problem today. Therefore, no laws were enacted to regulate the situation. Competition did not permit a company to spend a lot of money on vague measures that were not seen to produce a profit.

In Ontario, "how to prevent" led to research on the problem and then visits to Saskatchewan, Alberta and B.C. followed by Quebec and Nova Scotia/New Brunswick to see what regulation they had and to find out how they administered their legislation.

Previous administrations in Ontario had been making attempts to amend the Mining Act since 1972 but had concentrated mostly on the exploration end of mining operations - how to stake a claim etc. Now we still needed to deal with that but we particularly needed to address the closure of mines.

When one considers the legacy of abandoned mines, one thinks of cave-ins as above, and the hazards of open holes. There is another problem, associated with sulphide in waste rock and tailings, the problem of acidic drainage. Often, particularly with base metal mines extracting copper, zinc, nickel or other metals found in chemical association with sulphur, there are other sulphide minerals present such as pyrite and pyrrhotite (iron sulphides). In the milling process, the desired minerals containing the copper, zinc or nickel are separated from the undesirable materials and the latter are deposited as tailings. It has been found that the sulphide in the tailings will often oxidise over long periods of time and, with the water present will form sulphuric acid which then can leach out or dissolve soluble heavy metal sulphates to pollute local waterways. This is known as acidic drainage and I'll come back to this point later.

After researching the other mining jurisdictions in Canada and other parts of the world, the Ministry of Northern Development and Mines produced a Green Paper that indicated the direction the government was thinking of taking. Public reaction was good on the whole to the operational and closure proposals and the Mining Act amendments were passed in the final days of 1989. The regulation is now being written and it is hoped to be in place for 1991.

The changes fell into three areas, claim staking, assessment work (both concerned with exploration) and Part IX "Operation of Mines". This was an old title that is something of a misnomer in that the Part now addresses the requirements for closure more than operations, although mining proponents will now be required to rehabilitate as much as possible while the mine is producing.

Potential pollution problems during production are controlled by the Certificates of Approval issued under the Environmental Protection and Ontario Water Resources Acts by the Ministry of the Environment.

Part IX of the Mining Act calls for proponents to deal with the potential problems of closure by preparing a closure plan before production starts. Prudent mining companies should also consider this to be an essential for the preparation of a proper feasibility study. The plan will be derivative to accommodate the type of operations proposed and the specific circumstances.

The Part IX process is proponent driven and depends on government acceptance.

The aim is to close out in a manner that assures long term stability.

The regulation will call for procedures to assure safety at the three stages of closure, i.e. temporary suspension, inactivity and closed out.

It will require that infrastructure, buildings, shafts and open pits be rendered safe, removed or prepared for other uses.

Tailings dams and waste rock piles will have to be stable both physically and chemically.

The cost of all these works will be assessed and a financial assurance required.

All this will need to be done **and accepted by the government** before production may start.

Existing operations will be required to address closure problems and to produce a closure plan within a negotiated period of time.

Not only mines, but advanced explorations projects, such as an exploration shaft will be subject to the new rules if the Director of Rehabilitation decides it is appropriate. What are the rules? The basic premise is that a proponent must file a closure plan (which includes a financial assurance) with the Ministry and have it accepted BEFORE the operations may start.

Again, before a mine or an advanced exploration project starts, the proponents must notify the Ministry. The proponent of a mine must and the proponent of an advanced exploration may also have to give public notice of the intended project. While the Mining Act does not require it, proponents will be encouraged to indulge in more public consultation, as necessary. It was deliberate that no parallel Environmental Assessment type procedure was adopted as legislation is already in place for that.

To bring you up-to-date on acidic drainage; it is a problem that has been long recognized in local circumstances but only recently seen to be a widely occurring problem with few effective methods of mitigation. The federal government set up the Reactive Acid Tailings Stabilization (RATS) committee to map out a program that would research and prove existing and new methods of predicting, preventing, controlling, treating and monitoring acidic drainage. Two years ago, the Mine Environment Neutral Drainage undertaking (MEND) was initiated by industry, federal and provincial governments to execute the RATS program. The price tag was estimated by RATS at $12.5 million and it has been agreed that this will be shared equally among the three proponents of the MEND program.

The objective is to develop a variety of methods to deal with AD so that proponents may be able to pick an appropriate method for dealing with their particular circumstances.

In summation, amendments to Part IX of the Mining Act, and the regulation being written, will require advanced explorationists and the mining companies to address the potential problems of closure before work is undertaken or production started, respectively. This is hoped to prevent future problems from abandoned mines and the avoidance or mitigation of any adverse effects on the environment.

N.B. The views expressed in this paper are the personal views of the author and must not be construed to represent in any way the views of the Government of Ontario.

PCB DESTRUCTION TECHNOLOGY EVALUATION

by

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P&R recently completed a report for Environment Canada titled "Options Available for the Treatment/Destruction of PCBs and PCB-Contaminated Equipment". In the process of researching the material for this report we delved at length into the United States experience with legislating and conducting PCB phase-out and destruction. We focused on the U.S. experience because we knew from our years of consulting experience that Canada, with the possible exception of Alberta, was having a heck of a time finding solutions to PCB phase-out and disposal and we knew that in general the U.S. was not having the same implementation problems.

U.S. PCB Disposal Regulations

By law, U.S. PCB generators have regulated disposal options. The following summarizes the disposal regulations in the CFR 40, Part 761.50.

1. mineral oil containing PCBs at 50-500 ppm must be disposed of by approved; incinerator, chemical waste landfill or high efficiency boiler;
2. PCB liquids greater than 500 ppm must be destroyed in approved and specially designed incinerators;
3. PCB transformers (>500 ppm) can be incinerated in an approved incinerator or drained, solvent rinsed (for 18 hrs.) and landfilled in an approved chemical waste landfill;
4. PCB equipment (<500 ppm) for disposal must be drained but the disposal of the equipment is unregulated;
5. small capacitors can be disposed of by non-manufacturers in municipal solid waste landfills;
6. large capacitors which contain 500 ppm or greater PCB must be incinerated at an approved incineration facility;
7. manufacturers must dispose of all capacitors in an approved incinerator.

U.S. PCB Phase-Out Program

The U.S. PCB phase-out plan is summarized (in general) below from the Code of Federal Regulations, 40 CFR Part 761.30 (under the Toxic Substances Control Act).

- as of October 1, 1985, the use and storage for reuse of PCB transformers (>500 ppm) that pose an exposure risk to food or feed is prohibited;
- as of October 1, 1985, PCB transformers (>500 ppm) with higher secondary voltages (>480 volts) cannot be installed in or near commercial buildings and by October 1, 1990, these transformers must be removed from near or in commercial buildings;
- as of October 1, 1990, PCB transformers (>500 ppm) with secondary voltages less than 480 volts in use in or near commercial buildings must be equipped with electrical protection to avoid transformer failure caused by high currents;
- as of October 1, 1988, the use of large (contains >1.36 kg of PCB fluid) PCB capacitors is prohibited if they pose an exposure risk to feed or food - also they are prohibited from any use unless they are used within a restricted access location;
- any PCB material (>50 ppm) entering storage for disposal must be removed from storage and disposed of by an approved method within one year of first entering the storage.

The above general summary demonstrates that the U.S. phase-out effort is directed mainly at PCB transformers containing over 500 ppm PCB and large capacitors. It is very interesting to note and emphasize that the storage of PCB materials is limited by law to a maximum of one year.

As demonstrated in the previous two overheads, PCB generators in the U.S. have a set of clear, concise phase-out legislation telling them when certain PCBs materials should be out of service and they have numerous approved options for disposal. The hazardous waste service sector has responded to this with the development of technologies to destroy, treat and decontaminate PCB materials.

It is also important to note that the legislation is federal and we understand it is consistently applied across the U.S. This is extremely important to the hazardous waste service industry which will only invest in the required R&D and construction of facilities if a large market is available. The hazardous waste service industry has responded by:

- providing a large number of industrial incinerators and boilers for burning low (<500 ppm) level PCB contaminated oils:
- building 7 large dedicated PCB incinerators for highly contaminated materials;
- developing and building a fleet of mobile chemical destruction units for low level mineral oil decontamination and transformer decontamination;
- developing and building facilities for the decontamination of spend askarel transformers;
- developing technologies for in-service askarel transformer decontamination;
- developing and constructing mobile PCB incinerators.

So what are we doing wrong in Canada? With so many options available on this continent why are we not further along the road to solving our PCB problems. When we talked to the U.S. Environmental Protection Agency during our research for the PCB Options report they could not understand why Canada was so far behind.

Certainly a part of the problem is not having a clear consistent Canada wide legislative frame work for PCB phase-out and destruction. The lack of this frame work has made U.S. and Canadian hazardous waste service companies very wary of investing in equipment and facilities in Canada. You simply can't play the game if you don't know the rules.

Another important part of the problem is the often lengthy technology and site approval process in place in many provinces. This can impose undue financial hardship on remediation companies.

The last component of what went wrong in Canada has been the treatment of the subject of PCBs by the news media. Up until very recently the media have labelled PCBs variously as highly toxic, deadly, etc. - which they aren't. The media have been at best uninformed and at worst irresponsible. Public perceptions are hard to change but with concentrated efforts it can be done.

One of the most important messages we have to get across to the public is that there are no perfect solutions just responsible choices. I cannot tell someone at a public meeting that the best mobile PCB incineration technology available will not produce PCBs or dioxins or furans - they do but they also destroy 99.9999% of the PCBs. The choice is there - choose to store PCBs and run the risk of storage accidents like St. Basile-Le-Grand and Smithville or incinerate it.

We may behind progress in the U.S. but the Canadian picture is not all doom and gloom. Here's the present situation in terms of inventories and disposal options.

o **Contaminated Mineral Oil (<10,000 ppm)**

Inventory

- 40 million litres in use
- 4.2 million litres in storage

Treatment

- mobile chemical treatment units have treated over 10 million litres
- four companies PPM, Sanexen, Enser, Rondar

Problems

- need at least 10,000 litres at any one site
- inventory consolidation is a possibility either inter-company or intra-company consolidation
- siting a permanent or semi-permanent site to service small generators

Costs

- $1.00/litre for high volume, local, bulk oil treatment at low initial concentrations
- up to $5.50 for low volume and/or remote locations

o **In-Service Contaminated Mineral Oil Transformers (<10,000 ppm)**

Inventory

- 310,000 pole mounts (<500 litres) and 25,000 larger distribution and power transformers

Decontamination

- retro-filling if the transformers are small
    - hot retrofill with 1.5 volume flush = 5% leach back
    - cold retrofill with flush x 3 times = 10% leach back
    - cold retrofill with one flush = 15% leach back

- on-line to mobile chemical treatment unit if transformers are large = 3.5% leach back

Problems

- the more highly contaminated (>1,000) the more expensive

Costs

- $2.00 - $3.00/litre for a testing and retrofill program for large inventories of large transformers with low level contamination

- $5.00 - $10.00/litre for small inventories

- $28.00/litre Goose Bay (400 transformers, remote location, many pole mounts)

o **In-Service Askarel Transformers**

Inventory

- 10,000 askarel transformers in-service

Treatment

- repeated replacement of askarel fluid with special leaching fluid (perchlorethylene) or use of small distillation unit attached to the transformer.

- several companies offer this service (ENSR, Westinghouse, Unison) but only ENSR has used the system in Canada

Problems

- very expensive $25.00 - $33.00 U.S./litre including incineration
- still left with askarel fluid to store and eventually dispose.

ENSR's process is called System 50 and consists of the following steps:

- evaluation of the transformer to determine its suitability for decontamination and its potential service life (if suitable for decontamination the following is undertaken);
- de-energize the transformer; drain the PCB fluid; and re-gasket the transformer;
- refill the transformer with System 50 fluid and re-energize it;
- attach the System 50 processor to the transformer; the processor removes PCBs from the System 50 fluid over three to six months as PCBs are leached from the transformer interior;
- storage (on owner's property) of separated PCBs for eventual incineration;
- removal of the System 50 processor; and,
- testing of PCB levels after 90 days.

It is apparent from the cost of this service that the assessment of remaining life expectancy is an important factor. It may be less expensive in the long run to simply replace an aging askarel transformer. However there are other situations which can make this service attractive including situations where the transformer is built into a facility such as a basement or high rise tower where replacement may require costly structural changes.

Certainly our advice to anyone with an askarel transformer in a building which is in normal use by people whether its an office complex, residence or factory is to get it out of there. Fires caused by overheating or arching of askarel transformers in buildings have resulted in numerous multi-million cleanups (of PCB, dioxin & furan soot) and the loss of the use of the facility for up to one year or more.

o Waste Transformers

Inventory

- 18,000 askarel and 3,000 contaminated mineral oil transformers in storage

Treatment

- widely practiced as follows in U.S.
- prior to transportation to the fixed decontamination facility the residual PCB fluid is drained from the transformer (for eventual disposal by incineration);
- at the decontamination facility, the drained transformer is given a primary cleaning to reduce worker exposure to PCBs;
- the unit is dismantled and components such as the transformer tank, lamination, wires and brushings are separated;
- the separated components are given a second cleaning with solvent and the solvent is distilled for reuse;
- PCB liquids and combustible components (mainly wood and paper materials) are shipped to PCB incinerators; and,
- after testing, the metal components are smelted for metal recovery.

One Canadian Firm, Sanexen International (a division of Sanivan) of Montreal has an askarel transformer decontamination technology which it has used on a commercial basis in Quebec and Manitoba. The Quebec Ministry of Environment has developed a decommissioning criteria for transformers going to smelters for metal recovery.

For the Smithville PCB destruction project it is expected that MOE will allow the incineration contract, Ensco, to decontaminate, by solvent flushing transformers which are too large to shred and incinerate. The MOE site specific criteria established is expected to be similar to the U.S. criteria established for transformers destined for smelting which is 10 ug/100 m^2 PCB.

Chem-Security Limited are currently conducting research and development work, at the Swan Hills facility, on transformer decontamination for metal recovery/smelting purposes. Again, this method involves solvent flushing and distillation recovery of the solvent. Negotiations are on-going with the Waste and Chemical Division of Alberta Environment to establish a method and level to determine transformer decontamination.

Other than the Swan Hills facility, Canada does not have an approved PCB incinerator which is a key component in these decontamination methods. Until recently, Sanexen was shipping the PCB liquids and other combustibles generated in their decontamination operations to France for incineration. However, this was stopped in April of this year by new Federal regulation prohibiting the export of PCBs.

An alternative to the solvent flushing methods for decontamination is incineration of shredded transformers. Since fixed PCB incineration facilities are not readily available in Canada except in Swan Hills, this decontamination method has considerably less flexibility to service the Canadian market. However transformer incineration will be part of the two planned Canadian mobile PCB incineration projects in 1990.

Until PCB incineration facilities (mobile or otherwise) are more readily available in Canada, owners of waste PCB transformers can reduce their storage volume of PCB equipment by contracting one of the service companies offering the waste transformer decontamination service. Owners must first check with their provincial department of environment to ensure that the decontamination methods are approved and that the level of decontamination proposed is achievable and will allow disposal of the metal parts by smelting.

Costs for decontaminating transformers, for metal recover/smelting purposes range from $1.76 - $5.50 per kg. of (drained) transformer weight.

We have recommended in our report to Environment Canada that the Canadian Council of Environment Ministers develop a standard for the decontamination/decommissioning of drained waste PCB transformers which will allow metal recovery and smelting of transformer parts. This standard should be similar to the one used by the U.S. EPA to facilitate the use of U.S. decontamination methods.

- **Capacitors**

Inventory

- 236,000 in-service and 60,400 in storage
- plus 63 million light ballasts

Treatment

- high temperature incineration
- mobile incineration

o **Askarel (40% - 70% PCB)**

Inventory

- 18,600 tonnes in use and 3,500 tonnes in storage
- represents the majority of PCBs in Canada on a pure basis

Treatment

- high temperature incineration approved in Alberta, Ontario, Newfoundland
- we recommend mobile destruction

Problems

- siting (public perception)
- cost/volume of material required
    - small mobile incinerator 200 tonnes
    - large transportable incinerator 3,000 tonnes
    - $1,500 - $2,000 tonne

The only fixed PCB incinerator in Canada is available for Alberta wastes only; other fixed PCB incinerators planned for Ontario and Quebec are at least 4 - 5 years from realization and the border is closed for access to U.S. fixed incinerators. Therefore we we believe mobile incineration is currently the most viable solution for destroying Canada's askarel inventory.

The mobile incinerators developed in the U.S. were designed primarily for site remediation work (soil incineration) and, therefore, are not necessarily well suited for PCB liquid incineration. However, the rotary kiln technology is adaptable to incinerating a variety of wastes including liquids as a separate feed stream.

There are currently three types of mobile/transportable incinerators approved for operation in the U.S.

- rotary kiln
- infrared incinerators
- circulating bed combustors

Table D.1 is a table of the makes, models and characteristics of the incinerators.

We see three alternative options for incinerating askarel liquids are as follows:

1. select a few sites which will service large areas;
2. select numerous sites which will only service the askarel liquids within a relatively small, local area; and,
3. some combination of the above.

Although these options refer only to askarel incineration, it is recognized that other PCB wastes can, and in some cases must, also be incinerated. As mentioned earlier, incineration is the only approved method for destruction of capacitors and light ballasts. Also PCB-contaminated equipment, soils, sludges, solvents and other materials can also be incinerated at mobile incinerator sites.

The first option of having only a few sites servicing large areas would economically favour the use of large, transportable incinerators such as the ENSCO MWP 2000 and the second option of having many sites servicing smaller areas would economically favour a smaller, mobile incinerator such as the Vesta 80 or 100.

The ENSCO MWP 2000 can be economically (e.g. competitive with smaller units) operated at sites with at least 1,500 - 2,000 tonnes of askarel to burn for a total burn period of 3 - 4 months (80% operational factor) and a total on-site period of 6 - 7 months.

The Vesta 100 can be economically operated at sites with at least 200 tonnes which could be incinerated in 14 days.

There is no single industry or utility generator of askarel in Canada large enough to support the on-site use of equipment the size of the ENSCO MWP 2000. Equipment of this size could, therefore, be used to service many askarel generators in geographical areas with high concentrations of askarel, e.g. Ontario and Quebec. Also, the incineration of other PCB-contaminated materials at these sites would help lower the per unit incineration costs.

The use of smaller equipment such as the Vesta 100 could be economical for the large generators of askarel and other PCB material on an individual basis or at regional sites in areas of Canada with smaller inventories of askarel.

The cost for incineration of askarel under the above noted minimum quantities ranges from approximately $1,500 to $2,500/tonne ($2.00 - $3.00/litre).

Given the high priority which the destruction of these liquids should be given and the difficulty in siting the incinerator(s), it may be appropriate for the federal and provincial governments to take a lead role in providing regional sites. The close cooperation of municipal governments will be required.

THE ENVIRONMENTAL DECOMMISSIONING OF THE HOLMES FOUNDRY SITE

by

P.L. Hansen, Chrysler Canada Ltd.,
Windsor, Ontario

In 1987 Chrysler Canada purchased Holmes Foundry as part of the acquisition of American Motors by Chrysler Corporation. Holmes Foundry was a medium sized ferrous casting plant located in the Sarnia, Ontario area. It produced approximately 500,000 engine block castings a year for American Motors and other companies and employed over 400 people.

The foundry was built in 1919 as a supplier of engine blocks for Ford and for most of its 70 year history it concentrated on engine block manufacturing and small castings production. Holmes has had many successes over the years in design and engineering including pioneering development of the first V8 engine block for Ford in the 30's and the development of light, thin wall engine blocks during the 70's.

American Motors had already slated the facility for closing because of its age prior to purchase, and Chrysler concurred with that decision and closed Holmes Foundry permanently in September 1988. Since the property was not required by Chrysler, it was decided to decommission the site according to the Ontario Ministry of the Environment's (MOE) interim draft guidelines first published in August 1987 and sell it to private developers.

Chrysler is committed to good environmental stewardship and we realized that the clean-up of this site would take a lot of money, time and effort. At the outset we only had a preliminary estimate of what a clean-up entailed, based upon our experience with the U.S. decommissionings ongoing at the time.

After preliminary site assessments were completed, only a relative minimal amount of contamination was found in the foundry and only moderate soil contamination was detected on the property.

Chrysler made the commitment to the MOE and to local residents to turn this property over to the new owners in an environmentally acceptable condition, meeting the standards developed in the January 1989 Ontario Decommissioning Guidelines. Since the property is intended for residential redevelopment of industrial lands, the standards for residential clean-up of contaminated lands was chosen as the acceptable criteria for decommissioning.

What is Decommissioning?

It is defined in the January 1989 MOE "Guidelines for the Decommissioning and Clean-up of Sites in Ontario" to mean the mothballing, partial closure or complete closure of facilities. It may or may not be associated with a site clean-up.

As applied to close-out an industrial facility, it has come to mean the process of:

- Evaluating the conditions of buildings, plants and materials.
- Establishing soil, ground and surface water conditions.
- Removing and disposing of hazardous and non-hazardous waste and raw materials.
- Cleaning-up or disposing of buildings, equipment, contaminated soil and groundwater.
- Restoring the property so that it can readily be used for agricultural, recreational, residential, commercial or industrial purposes.

These guidelines constitute a recommended approach only for decommissioning and are not legally enforceable regulations. However, many corporations are now adopting the intent of this document for decommissionings in Ontario.

In the case of the Holmes Foundry decommissioning project, only clean-up of the site and facility was involved. The buildings were left standing for the new owners to demolish; however, all hazardous substances, liquid industrial waste or any contaminated soils not meeting the guidelines were all removed by the time of closing the sale.

Chrysler retained two consultants for the decommissioning work, The Chester Engineers of Ann Arbor, Michigan and MacLarentech of Toronto, a subsidiary of MacLaren Engineers and Lavalin. Chester had extensive knowledge in decommissionings of industrial plants in U.S. where they had been retained by Chrysler Motors to do a number of facility clean-ups including deactivation of manufacturing equipment. They performed the initial site assessment prior to shutdown in order to:

- Assess regulatory requirements pertaining to facility shutdown and clean -up.
- Identify process equipment and plant areas requiring decontamination.
- Specify general procedures to be employed to facilitate decontamination.
- Identify areas requiring additional investigation including possible soil and groundwater contamination.

While Chester was preparing specifications for general clean-up, Chrysler retained MacLarentech to do the initial characterization of the soil and groundwater on the site. The total job responsibility was split between Chrysler, Chester, and MacLarentech as shown.

CHRYSLER'S RESPONSIBILITIES

- Overall project management.
- Contact and liaison with MOE.
- Contact and liaison with agencies, public bodies, media, and concerned citizens.
- Contact with new owners and their engineers.
- Select and hire contractors.
- Auction and sell equipment.
- Provide temporary power and 24 hr. security.

AREAS OF CONSULTANT RESPONSIBILITY

CHESTER ENGINEERS

- Overall Decommissioning Report
- Initial Assessment
- Clean-up Criteria
- Facility Cleaning
- Tunnel Cleaning
- Underground Tank Removal
- Barge Removal & Shoreline Restoration
- Final Tagging and Buy-off
- Final Tagging and Buy-off

MACLARENTECH

- Soil and Groundwater Characterization
- Asbestos Removal
- PCB Removal
- Electromagnetic Survey
- Public Meeting
- Soil Remediation
- Resident Engineering
- Historical Survey
- Disposal of Foundry Process Materials
- Laboratory Testing
- Verification Tests

The regulatory considerations in the environmental deactivation included:

- 1989 MOE Decommissioning Guidelines for Industrial Sites
- Hazardous Waste Disposal under MOE Reg. 309
- Federal and provincial PCB Regulations, 11/82
- Asbestos removal Regulations MOL 645/85
- Underground Tanks under the Ontario Gasoline Handling Act Reg. 439
- Air Emissions MOE reg. 308
- Ontario Water Resources Act
- Water Management: Goals, Policies and Objectives
- Waste Water Discharges according to City of Sarnia By-laws

In addition, the consultants used as guidelines information from Quebec, USA and the ongoing decommissionings of the oil refineries in Ontario.

Holmes Foundry was located in the Village of Point Edward near the Blue Water Bridge between Exmouth St. in the City of Sarnia and the 402 Highway. The plant area was 18,000 m^2 (200,000 sq. ft.) consisting of one large building and 5 smaller ones. The main property was 7.0 ha (17 acres) and the surrounding area includes single family residences, high-rise apartments, parkland, Highway 402, a stadium, a gas station and immediately across Exmouth St. in Sarnia the new City of Sarnia police headquarters. A smaller piece of land 1.1 ha (2. acres) at the foot of Exmouth St. adjacent to the St. Clair River at the Winter Harbour. The river property was used for foundry sand storage and docking facilities for off-loading sand. An old lake freighter later converted to a barge had been sunk in the 60's and filled with foundry sand to serve as a dock.

Cleanup of Buildings and Equipment

After an initial assessment, The Chester Engineers identified 23 areas of environmental concern for deactivations at the foundry. These included the following:

Environmental Deactivation Area Categories

1. Underground Storage Tanks
2. Aboveground Exterior Tanks
3. Aboveground Tanks
4. DMEA (Dimethylethylamine) Aboveground Tanks
5. Oily Sumps and Pits
6. Building Pits
7. Isocure Tanks
8. Cupola Scrubbing Equipment
9. PCB Components
10. Process Equipment
11. Taccone Line Equipment
12. Special Floor and Room Areas
13. Yard Debris Area
14. Dust Collectors
15. Conveyors
16. Drum Marshalling Area
17. Rooftop Areas
18. Sewer Systems
19. Tunnels and Vaults
20. Non-PCB Transformers
21. Sand Pile Property
22. Proprietary Tanks and Systems
23. Scrubber Equipment

Cleaning specifications and contracts were established for all the components which required cleaning.

In all, 321 units were completely cleaned and verified as environmentally assured. Some were sold by Chrysler and others left for the new owners to sell cr demolish.

All above-ground tanks were emptied, chemically cleaned and either sold or left in place. This included the associated piping and pumps.

Four underground tanks were removed from the site and were cut-up by an approved scrap dealer. Soil tests surrounding the tanks showed no exceedences for organic parameters.

All hydraulic oils on site were removed from the equipment and analyzed for PCB;s prior to removal. Also any sludges and oily wastes were examined for PCB's and leachate toxicity prior to removal.

All ducts, hoods and scrubbers connected with the cupolas were scraped and the scrapings were sent to Tricil as hazardous because of PAH concentrations. Where it was not feasible to scrape the ducting completely, the entire exhaust system was sent to Tricil for disposal. The brick lining of the cupolas was also tested and taken to Tricil.

Numerous containers of raw materials, chemicals and other products stored on the property were either sold or disposed of properly. This included the implementation of a drummed waste management program to classify, sample, and identify all waste materials. Hazardous materials not sold were registered with the MOE as wastes pursuant to Ontario Regulation 309 and safely disposed of at approved sites.

Prior to the clean-up process, all sewers including the stormwater were blocked at the point of discharge to the street to prevent any contaminated water from getting into the municipal system. The runoff waters were routed to a pit and from there pumped into the municipal system if tests showed that it met the city discharge by-law. If the waters exceeded the parameters then a private hauler took the wastewaters to an approved treatment plant.

All horizontal process and storm sewers were cleaned using high pressure wash equipment. All foundry sand found in the drains was removed.

One of the main process sewers was an abandoned network of 6' x 6' tunnels running the length of the building which had been converted to a sewer. The sediments in nearly half the tunnels was tested as leachate toxic for cadmium and registerable for lead. Samples from side rooms filled with spent foundry sand were found to meet the decommissioning guidelines. One area of the tunnel was found to have a very localized elevated level of PCB's at 54 ppm. The PCB wastes from this area were removed, placed in drums and taken to an on-site storage area. The tunnels were excavated, broomed and steam cleaned by Sevenson Environmental of Burlington.

Hazardous sludges from the tunnels was sent to Tricil after setting the material with powdered cement and foundry sand. The tunnels themselves were exposed along their total length by breaking up the floor for ease of cleaning and safety of personnel.

Soil Characterization

To characterize the soil conditions, initially a preliminary assessment was carried out to categorize the historical information and to establish major targets for subsurface investigations. Within a month after the plant shutdown in September 1988, 25 boreholes and monitoring wells and 52 surface samples were established across the property to characterize the soil and groundwater conditions. The Holmes Foundry property was found to be generally overlain by a sand fill containing trace amounts of gravel silt, organics and slag. In many areas fill had been used to reclaim swampy ground and the nature of the fill could vary considerable over short distances. This necessitated taking many surface samples to characterize the heavy metal contamination. The aquifers and groundwaters were tested for heavy metals, PAH's, PCB's, chlorinated organics and BTEX's. The groundwater was found to be free of inorganic contamination and all organic parameters except for oil, grease and phenols found in several locations associated with petroleum storage. Since no wells or other groundwater uses were in the vicinity and all of the contaminated areas were being excavated for heavy metals, the groundwater remaining in the holes after excavating was pumped out by tanker and sent to a private treatment facility.

An electromagnetic survey was performed to characterize the property. Initially, there were some doubts as to the usefulness of an electromagnetic survey with the abundance of ferrous scrap on the site and the close proximity of the buildings. However, the results were very good, with 20 sites indicating anomalies. Test pitting identified 3 areas of buried drums with the rest of the sites turning up scrap steel, cupola skulls or "nuggets" and reinforced concrete.

One of the major unexpected findings in digging for anomalies was the presence of buried fibre insulation mats containing asbestos. This led us on a whole new investigation to define the areas of asbestos contamination in the soil and methods of clean-up.

Public Consultation

As part of the Decommissioning Guidelines and prior to any remediation programs being carried out, Chrysler held a public meeting at a nearby hotel. The open house and evening meeting was well advertised in three different local newspapers, including general interest write-up by the media. In addition, over 200 neighbouring residents were personally invited to attend the sessions.

The open house included presenting all our reports and information obtained to date and the proposed plans for remedial action. The meetings were attended by over 100 people, including print and broadcast media. The response to our plan was overwhelmingly positive and the resulting newspaper articles were also very favourable.

PCB's

Since the buildings were being demolished by the new owners and no PCB's were to be left on site, a two phase program was initiated:

Phase I

A. Establish a temporary on-site PCB storage area.
B. Identify and label all PCB components.
C. Remove PCB components to storage site.

Phase II

A. Identify options for PCB relocating PCB's off-site.
B. Obtain regulatory permits for transfer.
C. Transfer of PCB's.

In the first phase the two askeral transformers on the site and all the capacitors were itemized and labelled with Environment Canada's serialized PCB labels. Thomas Environmental removed all these materials according to MOE approved methods. In addition, all fluorescent fixtures were checked for PCB containing ballast and removed as required. Outdoor lighting ballast and indoor halide lamp ballasts were also included. Three separate verification inspections were performed to ensure that the site was PCB free. These materials were stored in two modified 40' international shipping containers which had been inspected by the MOE and local police and fire authorities.

For the second Phase many options were considered for taking the PCB's off-site. Both destruction and export options were unavailable and the only possible one was transferring the material to another Chrysler location in Ontario.
Chrysler's Windsor plant was selected as the site most likely since we already had a well established PCB storage site which had enough capacity to accept the material. Chrysler Canada's environmental policy required that all municipalities connected with or likely to be affected by this move would have to be informed and approve of such an action. To minimize the number of affected municipalities along the route, it was decided to take a route east along Highway 402 to near London and then take Highway 401 back to Windsor.

Chrysler presented this plan to Windsor City Council and it was endorsed as long as the police and fire departments were informed. Thomas Environmental, our contractor, loaded two containers on flat beds and a convoy of seven vehicles, including a MOE person, left very early on a Sunday morning last summer for Windsor. All vehicles were equipped with cellular phones and the local police at both the sending and receiving municipalities escorted the convoy. The media were also made aware of the shipment and the reception in Windsor included the police, CBC, MOE, and Chrysler Public Relations.

The PCB containers were off-loaded at Windsor and placed completely inside an empty cell of the Ontario Registered 11/82 site.

Asbestos

A thorough and complete asbestos removal program was also instituted. All friable and non-friable asbestos components were identified and removed from the buildings. This included furnaces, ovens, piping and ducting insulation, cement boards, cement panels, ceiling tiles and even floor felts underneath the floor tiles.

The piping asbestos was removed using the standard glove bag techniques utilized by the industry and disposed of in accordance to the Reg. 309 and the Transportation of Dangerous Goods Act.

In addition, the one building which had been used for asbestos products manufacturing, and although previously cleaned, it was completely HEPA vacuumed and power washed on all interior surfaces to ensure complete removal of all fibres.

Another unique aspect of asbestos removal was the discovery of asbestos contaminated soil in one area of the property. Bats of insulation containing asbestos had been placed on a low lying area and covered with foundry sand. This material, after much consultation with the MOE, the Ministry of Labour, and the local medical officer, was eventually removed out in bulk with the soil during the soil excavation phase by wetting it down, placing it in a truck, covering the material with non-asbestos bearing soils and tarping the load completely. A total of 1,200 M^3 was removed by this method.

Soil Remediation

The single largest phase of the decommissioning program was the actual soil remediation. Extensive testing of the property for heavy metals resulted in establishing demarcated areas based on the vertical and lateral extent of soil exhibiting contaminant concentrations in excess of the residential guidelines. Metropolitan Environmental of Toronto carried out the contract to remove and replace 21,000 cu. metres of soil at depths up to 3 metres and dispose of the material at an approved landfill in Kent County. Most of the material exceeded the guidelines for heavy metals namely copper, zinc, cadmium, mercury, cobalt and beryllium. Material suspected of being leachate toxic was placed in a contamination area and tested prior to disposal. Care had to be taken during the excavating not to disturb the underground sewers and to work around the old foundation walls.

Verification samples were taken after excavating on all sides and bottom of the excavations. The analytical laboratory, Enviroclean in London, was set-up to analyze all samples overnight and fax the results back the next morning to allow either further excavating or backfilling with approved clean material if the results met the residential standards.

In total, over 12,000 analysis were completed in order to define the extent of the contamination and over 15,000 analysis were performed in order to verify that all contaminated soil was removed from the site.

Extensive excavations were also carried out inside the structures where high levels had been detected below the concrete floor. Excavations were continued in all directions, even under column supports until all the soil met the decommissioning guidelines.

Throughout the whole decommissioning process, the plant was in contact with the MOE Sarnia office on an ongoing basis with formal meetings held bi-weekly. All MOE meetings and correspondence were tabulated in a report of On-site Decommissioning Activities, along with correspondence from all other agencies on this subject.

The MOE conducted periodic inspections and requested additional samples and tests as required. In one test all piping in the main building was cut at different cross sections of the building to ensure no liquid materials was left standing in the pipes. Another test of the dust on a roof beam in the core room area, indicated that the material although non-registerable for leachate, nevertheless exceeded the guidelines for residential use and could contaminate the soil during demolition of the building if it fell off the beams. This re-evaluation led to scraping and vacuuming of the ceiling and joists of a large portion of the building for dust and soiling which did not meet residential guidelines.

Historical Usage

As part of the decommissioning documentation, a report was prepared detailing the history of material usage, disposal and areas of concern. Aerial photographs from the 50's, 60's and 70's were closely examined to review past management of waste products, and past employees were interviewed to research the spill history of the foundry. This resulted in several areas being investigated and subsequently remediated - one being a former residential home area where old basements had been filled with material exceeding the guidelines and another being a site of previous drum storage area.

Barge Removal

Associated with the Holmes Foundry Decommissioning was the removal of a barge sunk in the early 1960's to act as a dock for foundry sand off-loading. The 350' barge had been backfilled with spent foundry sand, slag, asbestos and rock wool. Robbins Construction of Sarnia was retained to empty and properly dispose the contents, cut the hull into pieces for scrap. All asbestos bearing materials were wetted down and removed in bulk with the same methodology developed at the main site. The hull was repaired with divers and refloated after being emptied and the top sections progressively cut away and removed. A total of 7,100 cu. metres of foundry sand and debris were landfilled and 700 tons of steel was reclaimed for scrap. The shoreline was sloped back and resurfaced with rip rap.

Statement of Decommissioning

Since all verification testing results on the property met the residential guidelines, on-going monitoring of the site was not required by the MOE. All agencies were notified, including the press, when the total clean-up was completed and that the MOE would issue a statement of "Completion of the Decommissioning".

The statement itself, signed by the Regional Director, was a nine page document which detailed sixteen items, basically covering all the points that have been carried out at the site and described previously.

The statement positively states that the MOE worked in close liaison with Chrysler and monitored the activities through site inspections, audits and review of reports for compliance with applicable legislation and guidelines. Also, the MOE is satisfied that Chrysler has complied with the current guidelines to the extent required for residential development. Included were also statements which are intended absolved the MOE of future liabilities. They stated that environmental problems rest with the responsible parties according to the law.

The final condition required that the statement be registered on title at the closing of the sale.

The total cost of the clean-up of $7 million is as follows:

DECOMMISSIONING COSTS
($000)

Tank cleaning and removal	$ 150
Environmental cleaning	800
Tunnel clean-up	750
PCB removal	300
Asbestos removal	250
Subsurface investigations	300
Soil remediation	3,000
Barge removal and site restoration	700
Engineering	750
Total Cost	$ 7,000

In conclusion, the total clean-up effort was a real learning curve, not only for ourselves, but also for the MOE, our consultants, and contractors and other agencies. The 14 months required for completion included a 6 month extension brought about by unexpected findings and delays caused by the complexities of the job. We would advise others to carefully plan Phase I activities with the MOE and allow more time for the planning process.

We were pleased with the positive response we obtained from the people and the media in the Sarnia area, Chrysler Canada was the MOE's nominee for a Conservation Award from the St. Clair Region Conservation Authority for demonstrating concern for the proper management of our renewable natural resources.

Chrysler Canada supports the efforts of the Ontario Government in establishing criteria for clean-up of contaminated sites. These guidelines helped us immensely in defining the scope of a decommissioning project and we trust that Chrysler's experiences in decommissioning Holmes Foundry will assist the Ministry in furthering the development of site decommissioning in Ontario.

SESSION IV— WASTE REDUCTION AND RECYCLING

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WASTE REDUCTION INITIATIVES

by

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Introduction

Non-hazardous residential, commercial and industrial waste generation in Ontario amounts to approximately 9,000,000 tonnes per year. This is equivalent to about 1 tonne per person per year or 2.75 kilograms per person per day.

In Ontario today most of the resources in the waste management sector, both public and private, are directed to burial of waste in landfill.

A complete waste management system today must involve waste reduction, reuse and recycling components, commonly referred to as the 3Rs, in addition to disposal methods such as landfill and incineration. Although this terminology is widely used there is variation in the meanings. The 3Rs as used by the Ministry are described as follows:

- **Reduction** refers to actions which lessen the amount of waste a generator eventually needs managed.
- **Reuse** identifies actions which are based on using something over again in its original form, for the same purpose or some new purpose, until such time as it becomes waste and needs management.

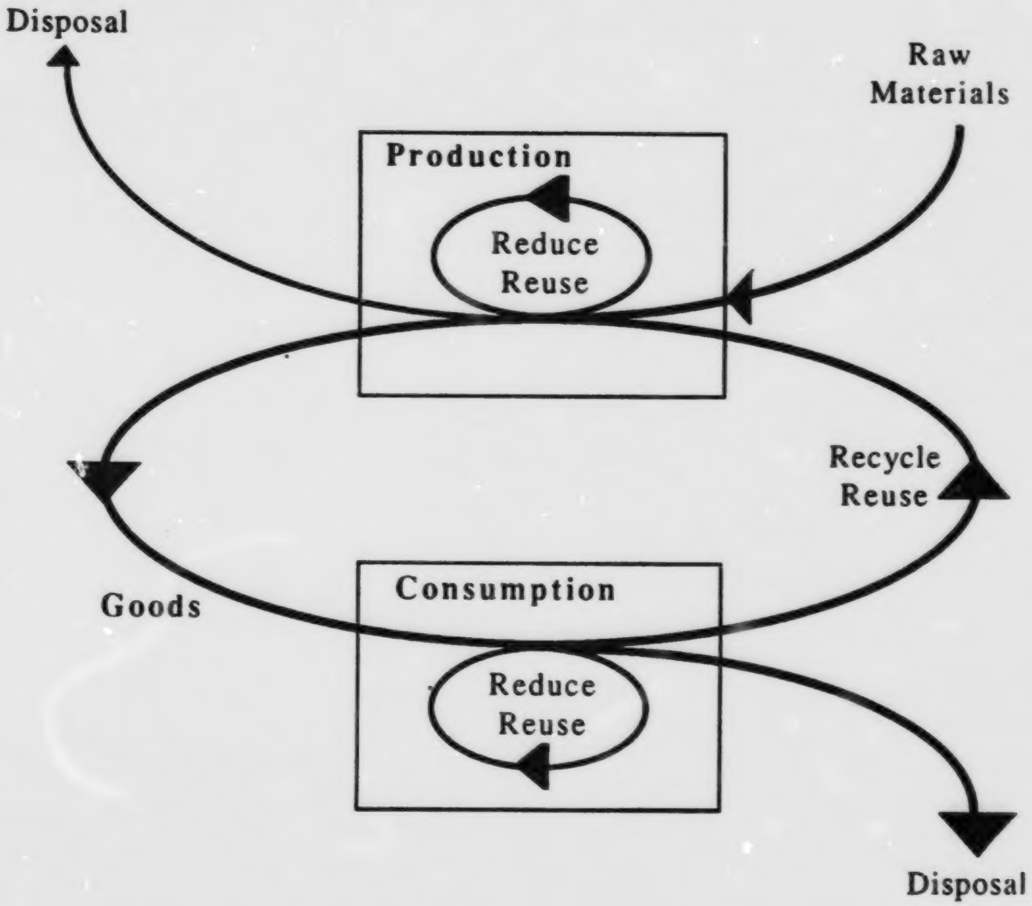
Reduction and reuse, by these definitions, occur before something becomes waste. Two basic options remain once a waste is eventually generated: recycling and disposal.

- **Recycling** represents actions which manage waste in a manner that results in using the materials which constitute the waste as feedstock for some product or application distinct from disposal. This occurs through segregation of waste at source or by extracting materials from waste through various means.

Society operates within a complex system of production and consumption which involves many different sectors. These sectors include industries which make basic raw materials, manufacturers who build the products, commercial services, retailers and distributors. Consumers include the general public, industries, businesses and institutions all of whom produce waste. A complete framework for waste management therefore involves all of these sectors.

When viewed from this perspective the scope for 3Rs shows great potential because all of the sectors can practice the 3Rs. Figure 1. depicts a simplified representation of this view of waste management and the 3Rs as part of the production/consumption cycle.

Figure 1. The Production/Consumption Cycle


Disposal
Raw Materials
Production
Reduce
Reuse
Recycle
Reuse
Goods
Consumption
Reduce
Reuse
Disposal

3Rs Development in Ontario

The Ministry of the Environment has been involved in the 3Rs as early as the mid-1970's, however, the first full scale use of the Blue Box system as a recycling method in 1983 in Kitchener, Ontario may be the most recent event which has had an impact on shaping the 3Rs in Ontario today. The Blue Box has become the most prevalent symbol of recycling in Ontario today although that wasn't obvious in

1983. Many events since then have advanced the 3Rs in Ontario. A brief summary of these events is useful.

New beverage container regulations were promulgated in 1985. As a result of these regulations the Recycling Advisory Committee was formed to advise the Minister of the Environment on matters related to beverage containers and on means of expanding recycling in the province.

In 1986 Ontario Multi-Material Recycling Inc., the original OMMRI, was formed by members of the soft drink industry and its material suppliers. This was a new example in Ontario of co-operative government/industry action to address waste management issues.

In 1987 the Ministry of the Environment announced a major expansion of its programs to support municipalities and industry. The six-year old program supporting recycling in municipalities, was joined by others aimed at supporting all 3Rs in municipalities and more importantly, a program was added to help the private sector implement 3Rs projects.

In 1988, the number of households served by a Blue Box system broke through the 1,000,000 mark. People in Ontario were becoming very familiar with this recycling method.

In 1989, the Ministry announced that by the year 2000, Ontario should divert 50 percent of its waste from landfill and incineration and into beneficial uses through the 3Rs. A commitment was made to provide significant resources to the achievement of these objectives.

In February 1990, the scope of the government/industry model based on OMMRI was broadened. The Minister of the Environment signed a Memorandum of Understanding with a new organization, OMMRI II, to support an expanded 3Rs program. The soft drink industry joined with the newspaper publishing sector, the packaging industry, the plastics industry, as well as grocery products manufacturers and distributors to create OMMRI II.

In March 1990, the Canadian Council of Ministers of the Environment endorsed the National Packaging Protocol. This is a significant co-ordinated Canada-wide development to address the specific issue of packaging in waste and what to do about it.

In May 1990, the Minister of Government Services announced new procurement policies in support of overall 3Rs objectives. This announcement is part of that Ministry's significant activities to implement 3Rs systems in the provincial government.

Just recently, the continued implementation of municipal Blue Box recycling systems broke the 2,000,000 household mark.

These are all significant events directly related to the 3RS. Others have happened which contribute to 3Rs development including all the waste management master plans underway across the province, significant private and public discussion of the "green" consumer and last but not least extreme difficulty in siting disposal sites anywhere in Ontario.

Getting to 50 percent

Experience to date shows that many of the components needed to achieve the 50 percent diversion goal are known. Many examples of these components are being practiced today in Ontario. The challenge is to build these components into a comprehensive whole and to make them widespread over the next decade. An examination of several of these components illustrates this potential.

Household Waste The most common example of a 3Rs component is residential Blue Box recycling. A typical recycling household can recycle a significant percentage of the materials available which would otherwise become waste. The most common Blue Box materials(newspaper, glass bottles, steel cans, aluminum cans and plastic bottles) represent approximately 21 percent of of a household's waste or 210 kg. per household year. A household using the Blue Box recycles 131.5 kg. per year or over 60 percent of the materials available. This represents over **13 percent** of the household's residential waste. Table 1. summarizes this.

Table 1. Impact of Blue Box Recycling in A Household

Material	Average Percent of waste	Kilograms Available per year	Kilograms Recycled per year	Percent Recycled	Percent of total waste
Newspapers	10	100	100	100	10
Glass bottles	5	50	20	40	2
Steel cans	5	50	10	25	1
Aluminum cans	0.5	5	1	25	0.1
Plastic bottles	0.5	5	0.5	10	0.05
Total	21.0	210	131.5	62	13.15

Another example is backyard composting as practised in thousands of households in Ontario. The average household produces 220 kg. of food waste annually. By using a backyard compost bin and depositing 1 kg. per week the household would reduce its food waste by about 24 percent and its total waste by **5 percent**.

The average household also produces over 150 kg. of yard wastes annually. By mulching this material(lawn clippings) rather than discarding them the household will reduce its total waste by up to **15 percent**.

The diversion capability for a household using these methods alone amounts to **33 percent** of its total waste.

Commercial Waste Based on recent research done by the Ministry of Government Services, offices generate approximately 1 kg. per worker per day. About 60 percent of this was found to be paper. Some offices in the province's paper recycling program are recycling 70 percent of this material or **42 percent** of their total waste.

A Comprehensive Municipal Plan Blue Box, composting, office paper recycling and other components, combine to form the total 3Rs system for a municipality. One example of this can be seen in Metro Toronto's 3Rs plans as reported in the January 1990 issue of SWEAP News. Metro projects that **25 percent** of its waste will be diverted from landfill by 1992. Table 2. summarizes the 3Rs components included in Metro's plan.

Table 2. Metro Toronto Waste Reduction and Recycling Plans-1992

Component	Estimated Material Diverted(Tonnes)
Public Sector Initiatives	
Blue Box - single family	80,000
Blue Box - apartment	30,000
Blue Box - Schools/parks	5,000
Large appliances	5,000
Small commercial establishments	10,000
Leaf composting	60,000
Brush&grass clippings	20,000
Backyard composters	10,000
Pilot wet collection	5,000
Sewage sludge ash	34,000
Public education	16,000
Charge on Municipal agencies	5,000
Demolition& construction	12,000
Private Sector Initiatives	
Disposal fee increase	25,000
Corrugated cardboard	53,000
Tires	9,000
Wood waste	35,000
Drywall	21,000
Office Paper recovery	14,000
Waste audits for industry	30,000
Industrial organic waste	120,000
Public education	8,000
Total	607,000
Percent of Metro's waste	25

This type of plan is illustrative of the type of planning and implementation effort now underway across Ontario by many municipalities in pursuit of 3Rs goals.

Industrial Waste Industrial waste quantity and composition is entirely dependant on the particular industrial sector, and therefore 3Rs potential is going to be dependant on the sector. There are numerous examples of industrial potential. One example is a full service lithographic printer of publications, directories and books. The company spends about $2,000,000 a year on printing inks.

About 9,000 gallons of waste ink is generated every year. All of this waste, which is hazardous, previously went to a hazardous waste disposal facility. A recycling process was installed which resulted in a **95 percent** recycling rate for the waste ink. In addition, this same company was able to recycle **30 percent** of its corrugated cardboard to further reduce its waste flow.

The above examples of household, commercial and industrial 3Rs components clearly show that the parts needed to achieve the 50 percent diversion goal are known and being practiced today. The challenge is to build these components into a comprehensive whole and to make them widespread over the next decade.

Government 3Rs Initiatives

The Ministry of the Environment has a significant number of policy and program initiatives in place and under development which are all aimed at assisting the further expansion of 3Rs in Ontario and the achievement of the diversion goal.

National Packaging Protocol Ontario is participating with the Federal government, other provinces, the Federation of Canadian Municipalities, the Consumers Association of Canada, environmental groups and industry representatives in a federal task force set up by the Canadian Council of Ministers of the Environment to implement the National Packaging Protocol(NAPP). NAPP addresses how best to deal with the waste created by discarded packaging.

NAPP consists of six policies, 3Rs targets to be achieved and related actions which are summarized below.

> **Policy #1. All packaging shall have minimal effects on the environment.**
>
> - Federal government to develop methodologies and guidelines for conducting environmental profiles of packaging including information allowing users to compare choices.
> - Industry to undertake environmental profiles of their packaging in accordance with federal guidelines.
> - Industry to prepare action plans and schedules to minimize environmental impacts and manage packaging through source reduction, reuse and recycling.

- Multi-stakeholder group to be established to identify research and development needs and new business opportunities

- Government and industry work together to demonstrate new technologies for minimizing environmental impacts.

Policy #2. Priority will be given to the management of packaging through source reduction, reuse and recycling.

- The Federal Government, in consultation with a multi-stakeholder group will establish a code of "Preferred Canadian Packaging Practices" to guide industry in the design of products and the selection and design of packaging. In development of the code consideration shall be given to the following hierarchy:

1) No packaging
2) Minimal packaging
3) Reusable packaging
4) Recyclable packaging and packaging containing recycled materials

- National minimum content standards will be developed by the Federal government for inclusion of secondary/post-consumer material in packaging.

- Infrastructure for reuse and recycling systems to be chosen and developed by Provincial and municiapl governments together with industry.

- Markets for secondary materials will be expanded through industry/government partnerships.

Policy #3. A continuing campaign of information and education will be undertaken to make all Canadians aware of the environmental impacts of packaging.

- Provincial governments will develop,with a multi-stakeholder group, education programs for use in schools .

- A national program will be undertaken to inform all Canadians of the functions and environmental impacts of packaging and to encourage environmentally sound purchasing practices. This program will be developed by a multi-stakeholder group.

Policy #4. These policies will apply to all packaging used in Canada, including imports.

- The federal, provincial and municipal governments will, with sensitivity to the needs of local industries, establish standards and regulations to apply these policies to packaging used in Canada, including imports.

- Federal government will act as liaison with other countries to promote the policies in relation to international trade.

Policy #5. Regulations will be implemented as necessary to achieve compliance with these policies.

- Federal and provincial governments will, with the participation of a multi-stakeholder group, enact regulations which are compatible across Canada, specifying performance requirements, targets, and deadlines for achievement consistent with this policy.

Policy #6. All government policies and practices affecting packaging will be consistent with these policies.

- Government policies and practices which impede achievement of the objectives of these policies will be identified and where possible removed or modified.

- Government policies and practices such as procurement, will be developed and implemented to support the achievement of these objectives.

Targets for the 3Rs have been established by the NAPP as follows:

- By December 31, 1990 all provinces must have in place a nationally co-ordinated data collection program to make possible the monitoring of the following targets .

- By December 31, 1992 packaging sent for disposal shall be no more than 80% of the amount sent in 1988.

- By December 31, 1996 packaging sent for disposal shall be no more than 65% of the amount sent in 1988.

- By December 31, 2000 packaging sent for disposal shall be no more than 50% of the amount sent in 1988.

- 50% of these diversions shall be achieved through new source reduction and new reuse initiatives. Recycling programs shall make up the remainder of these diversions.

Government/Industry Initiatives The Ministry is developing a mechanism to ensure that the industries that are in sectors similar to the member companies of OMMRI II will participate in achieving 3Rs objectives.

Preliminary assessments are being made to establish other potential industry sectors(OMMRI III, IV etc.) with which the government can participate using the OMMRI model.

Approvals Requirements The approvals requirements for facilities which involve recycling systems are under review to determine ways and means of streamlining the process, providing a consistent approach to applicants, and encouraging recycling while maintaining necessary environmental controls.

Municipal 3Rs Programs The Ministry continues to provide financial and technical support to municipalities and others to implement 3Rs projects for municipal waste. A series of programs are available:

- The **Municipal Recycling Support Program** provides capital grants of up to one-third and operating cost grants up to 50 percent for residential recycling using the Blue Box, depots and other source separation approaches. The grants are provided in conjunction with OMMRI and have resulted in a system diverting over 250,000 tonnes of recyclable materials per year.

- The **Municipal Reduction/Reuse Program** encourages reduction of waste from households. This includes an extremely successful home composting program where the Ministry provides up to 50 percent of the costs of the backyard bins purchased by a municipality . Grants for over 120,000 bins have already been committed to date. Projects considering another 80,000 bins are under development bringing the total to 200,000 bins to date.

- The **Municipal Waste Recovery Program** supports recycling through capital grants for systems such as the "wet/dry" system which is being supported by the Ministry in major projects in Guelph and elsewhere.

Table 3. summarizes the municipal programs available and the associated expenditures in fiscal 1989 close to $18,000,000. The program budget has been increased in fiscal 1990 to $ 25,100,000.

Table 3. Municipal 3Rs Grants Summary - Fiscal 1989

Program Name	# Projects	Total Spent ($)
Municipal Recycling Support	209	15,428,000
Municipal Waste Recovery	14	1,284,000
Municipal Reduction/Reuse	41	1,071,000
Total	264	17,783,000

Certain aspects of the funding program have been enhanced. For example, the eligibility period for capital funding under the Municipal Recycling Support Program has been removed. Also, Blue Box bin grants are now available to communities implementing depot systems where there is no curbside collection.

A pro-active approach to encouraging 3Rs and providing assistance where needed to municipal governments is part of the program delivery. A close working relationship between the Ministry's regional offices and the Waste Management Branch enhances the support system to deal more effectively with local needs and development plans.

Information sharing is essential in a growth area such as 3Rs and the Ministry is jointly developing a database with OMMRI and the Recycling Council of Ontario to capture data and provide useful information to municipalities and others.

Student Action For Recycling Program This program is greatly expanding the implementation of recycling in Ontario schools. Approximately 900 schools in 18 boards are now involved under the program. Grants are provided to school boards and municipalities for planning and capital costs for equipment needed. In fiscal 1990 a budget of $3,200,000 has been allocated.

Household Hazardous Waste Program This program is very successful in assisting municipalities to divert or safely dispose household products which may be hazardous. The program provides up to $15,000 in grants including an incentive to encourage recycling rather than disposal for waste paints and crankcase oils which make up the vast majority of materials handled by these projects. Almost $1,000,000 has been provided in grants to date. Table 4. Summarizes the program to date.

Table 4. Household Hazardous Waste Program Expenditures To Date

Fiscal Year	#Projects	Grants($)
1986	9	77,900
1987	19	171,300
1988	36	324,700
1989	64	393,700
Total To Date	128	967,600

Industrial 3Rs The industrial/commercial waste in Ontario is estimated to be 5,000,000 tonnes per year representing more than 50 percent of the solid non-hazardous waste produced annually. Most of this waste is generally handled by companies themselves and not by municipal government. The Ministry assists the private sector through several initiatives designed specifically to address the needs of industry.

- The **Industrial Waste Diversion Program** provides technical and financial assistance to industry for projects designed to divert industrial waste from disposal through the 3Rs. Industrial and commercial companies as well as institutions are eligible for capital grants which provide up to 50 percent of the costs of the project.

- The diverse and technical complexity associated with industrial waste requires research and development in many cases to design a process or system to use the 3Rs effectively. The Industrial Waste Diversion Program provides grants up to 100 percent of the cost of this type of project.

It is a significant indication of the future 3Rs potential in Ontario industry that although the Industrial Waste Diversion Program was initiated in 1987 the 125 capital projects approved to date represent a combined diversion of 730,000 tonnes of solid waste and 15,600,000 litres of liquid waste annually. This is equivalent to a 15 percent diversion rate. Over 400 proposals have been received to date illustrating the significant interest and potential for industrial waste 3RS.

In a related area, the Ministry of the Environment will invest $16,000,000 in fiscal 1990 on a waste tire recycling program which includes:

- support for collection,handling and sorting used tires.
- developing and implementing technologies.

- market development research for tire derived products.
- underwriting use of rubber in asphalt applications

Market Development The recycling component of the 3Rs will represent millions of tonnes annually of waste materials requiring an end use. The Ministry of the Environment and others are working to ensure these markets are there. Several initiatives will assist in this regard.

Assistance under the Industrial Waste Diversion Program is provided to companies which provide markets for recyclable materials. For example, the Superwood recycling facility in Mississauga inaugurated in May 1990 was made possible partly through support provided from the Ministry. The Atlantic Packaging deinking plant in Whitby will also receive Ministry support. The capacity of this plant, when combined with other existing markets, is expected to provide long term secure markets for Ontario's Blue Box newspaper supply. These types of ventures are essential if waste material are to be effectively recycled.

Co-operative efforts between the Ministry, companies and municipalities are a common approach taken to develop successful ventures. For example, the establishment of a successful telephone book recycling system in several municipalities and a film plastic demonstration project in Peterborough resulted from co-operative efforts of this type.

Technology Development The Ministry has initiated a number of technically oriented projects to satisfy information or policy development needs in Ontario.

The uncertainties with respect to the performance of degradable plastics, combined with the significant public and private debate about degradables and their role in addressing the waste management problem, suggested that a study was needed. A study of degradable plastics was conducted jointly with the Society of the Plastics Industry to help determine current facts about these materials. The study found that standards, definitions and other data are lacking and must be developed before effective policies can be put in place.

Composting is a significant component of the future 3Rs efforts in Ontario. Efforts are under way to develop guidelines and standards for large scale compost production, quality control, end use applications and facility siting. A study of the compost technical literature has been undertaken as a preliminary step to development of these guidelines.

The composition and quantity of waste are important facts to know when pursuing 3Rs approaches. It is more difficult, time consuming and risky to design an effective 3Rs method without knowing what is in the waste and how much. The Ministry has commissioned a study to develop a system to determine these parameters for Ontario's residential, commercial and light industrial wastes. Municipalities and others will be able to use this methodology in future for their own planning purposes. Results from the study process will also be useful to update information about Ontario's waste stream.

Communications The Ministry provides a number of general and program related information materials to a wide audience including young people, municipal officials, institutions and industry. In addition, ongoing contact is maintained with all client groups through seminars and meetings.

Some examples of the communications program include:

- "Hazardous Wastes in Your Home" - household products, their waste management and safe alternatives.
- "The Earth Times" - A humorous pamphlet about the 3Rs
- "Be a Garbage Transformer" - A pamphlet aimed at children
- "A Guide to Establishing a School Recycling Project"
- Information packages on all grant programs

Communications materials are constantly under development and many more are expected in the future.

Other Initiatives

Ministry of Government Services Program The Ministry of Government Services initiated a Waste Management Program in October 1989 which includes major 3Rs initiatives applying to the more than 80,000 government employees across provincial government ministries and agencies.

At the present time all government-owned buildings in Metropolitan Toronto have a full recycling program including fine paper, newspaper,cans, bottles and corrugated cardboard. Buildings leased by the government are also being included as negotiations are concluded with each landlord.

Government-owned and leased buildings outside of Metropolitan Toronto are now being included in this program with a goal of providing recycling services to 70 % of civil servants in 1990.

The Ministry has also undertaken a purchasing program to ensure the highest content of post-consumer recycled material in the paper products it purchases. The Ministry is now offering some 70 environmentally sensitive products such as recycled photocopy paper, envelopes and a reuse system for laser printer cartridges.

The government computer group is investigating a variety of new techniques designed to reduce the paper usage within the government. The initiatives range from computerized ordering to computerizing intergovernment and municipal phone books.

In May 1990, the Ministry announced a significant new development. It has implemented new procurement policies which are designed to contribute to the 3Rs goals of Ontario. The measures included in this policy are:

- mandatory standards for designated products which contain specified levels of recycled content from post-consumer waste.
- elimination of over-specification and unnecessary restrictions on goods and services that hinder the implementation of the policy.
- use of product specifications that are consistent with the national guidelines on minimum recycled content issued by Environment Canada.
- designation of goods and services which further the 3Rs.
- listing goods and services that lend themselves to the application of environmental considerations.
- listing suppliers who provide designated goods and services.
- establish and maintain minimum acceptable specifications for designated goods and services in conjunction with other jurisdictions.

- establish and maintain collective agreements for designated goods and services that must be used by all ministries.

Environmental Technologies Program In March 1990, the Ministry of the Environment announced the Environmental Technologies Program. The program will fund up to 50 percent of projects proposed by Canadian companies, universities, research organizations, municipalities, conservation authorities or public interest groups, to a maximum of $500,000 per year for up to three years.

The money is to be used for research, development and testing of products or processes and for full scale field trials and technical demonstrations.

In addition to air pollution, spills cleanup and other environmental areas, products or processes which include technology to reduce, reuse or recycle municipal, industrial or commercial waste are eligible.

Summary

Non-hazardous solid waste generation in Ontario amounts to approximately 9,000,000 tonnes per year. Waste reduction, reuse and recycling are recognized as the alternatives to pursue to divert waste from disposal.

All sectors in society can and must practice the 3Rs.

Beginning with the Blue Box, many initiatives have advanced the 3Rs in Ontario. These include beverage container regulations, OMMRI support, expanded Ministry support programs, setting a 50 percent diversion goal, OMMRI II formation, a National Packaging Policy and new procurement policies.

Many of the components for reaching the 50 percent goal are now available for implementation. Municipalities provide recycling services for 2,000,000 households using the Blue Box system and help residents reduce their waste through provision of over 100,000 backyard composting bins. Industries are implementing 3Rs projects which will divert 15 percent of industrial waste.

The government has a wide range of initiatives underway to support 3Rs development in Ontario. These include policies to support 3Rs through procurement, grant programs to help municipalities and industry and 3Rs practices within the government.

Ontario is moving steadily to a point where waste management will revolve around waste diversion in a sustainable way rather than remaining preoccupied with disposal.

OMMRI: CORPORATIONS IN SUPPORT OF RECYCLING

by
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Toronto, Ontario

First a little background. OMMRI was originally made up of and funded by the major Ontario soft drink companies, their container and container material suppliers. Together, the members committed $20 million over the period 1986 to 1990 to fund curbside "Blue Box" recycling programs on a cost sharing basis with the provincial Ministry of the Environment and those municipalities which implemented programs.

OMMRI contributed a third of the cost of the capital equipment--trucks, blue boxes, processing equipment--for municipal programs. We also set aside funds for the design of collection systems, training, promotion and development.

The system was made truly "multi-material" by including food cans and jars and newspapers along with soft drink containers, and it has worked extremely well.

In 1986, when OMMRI was launched, 150,000 Ontario households were involved in recycling programs. By May of this year, the opportunity to recycle reached two million single family homes, accomplishing in less than 3 1/2 years what was planned to do in four.

Now that two million houses, 144,000 apartments and 113,000 rural residences are on stream, the system is capturing nearly eight times the total tonnage of soft drink containers sold. And the network is expanding daily.

That represents an average of 16 per cent of the waste in these households diverted from the trash bin to the Blue Box. And those packages are made from materials which have intrinsic value and which are used by municipalities to offset some of their collection and processing costs.

A diversion rate of 16 per cent is significant but there is a growing awareness that much more needs to be--and can be--done.

Ontario's Ministry of the Environment has established targets of 25 per cent diversion by 1992 and 50 per cent by the year 2000 by focusing on the three R's--reduction, reuse and recycling including composting.

OMMRI: Corporations in Support of Recycling was formed at the beginning of this year as the result of a memorandum of understanding signed by the Minister of the Environment and six industry sectors.

These industry sectors are newspaper publishers and printers and their suppliers; grocery distributors, manufacturers and suppliers of grocery and related products; plastic products and packaging materials; and other packaging and packaging materials. And the soft drink manufacturers and their packaging suppliers, even though their original commitment has been fulfilled.

It is estimated that OMMRI, with its current industry sectors, will collect and distribute $45 million over its five year mandate.

There are four core elements to OMMRI's new operational program:

The first is **Research, Development and Demonstration** within which four needs have been identified:

1) *Markets for recyclable materials.* OMMRI's role is to encourage development of new market capacity, monitor supply and demand for recyclable materials and assist in the integration of new supplies in developing markets.

2) *Total waste management system needs.* To achieve reduction targets, projects other than residential recycling will need to be identified. OMMRI, with other interested parties, will: assess opportunities for waste reduction, identify mechanisms to adjust the program, design training programs, sponsor research into technological and social change and contribute to the evaluation of the system.

3) *Composting demonstration program.* This involves identifying relevant approaches; examining existing systems in other jurisdictions; evaluating alternative methods; selecting options suitable for testing; and launching demonstration programs.

4) *Commercial and institutional recycling demonstration programs.* The primary R&D tasks will be to assess commercial/institutional programs in Ontario; identify methods to improve them; demonstrate suitable approaches; assess impacts; and encourage program growth through training and information support.

The second part of OMMRI's operational program involves the **Capital Grant Program**, which incorporates five specific target activities:

1) Rolling out the Blue Box to 80 per cent of Ontario households by providing grants and technical assistance to launch, retrofit, expand and upgrade collection systems.

2)Improving capture rates of Blue Box materials by a minimum of 10 per cent through targeted promotions.

3) Expanding the field of plastics collection in the Blue Box system; determining cost effective collection and processing methods.

4) Evaluating markets and cost effective collection and processing of other recyclable papers--specifically household cardboard and boxboard as well as mixed paper from commercial and institutional sources.

5) Upgrading existing processing facilities to handle the additional volume of recyclables.

In terms of **Local Assistance**, the third aspect of the operational program, OMMRI will provide funds, technical expertise and promotional advice to municipalities to support new launches and the addition of new materials to existing Blue Box programs.

The fourth and final element of the operations plan involves **Communications**. Working from a detailed plan, OMMRI will undertake a program to communicate opportunities for waste management solutions.

The effect of all this will be to increase the materials collected through the "Blue Box" system from the 246,000 tonnes in 1989, to 678,000 tonnes per year by 1995. Gains are from the diversion of rigid mixed plastics and paper other than newsprint, and a more efficient, expanded system.

Let me pause to review exactly where we are now:

OMMRI has been successful beyond expectations. It accomplished in under 3 1/2 years what it hoped to do in four. About 60 per cent of the province has access to multi-material recycling; by the end of the year, this will be 70 per cent.

More people use their Blue Box than vote--80 per cent versus the 75 per cent of eligible Ontario voters who cast a ballot in the last federal election.

The expansion of OMMRI's industry base is well underway; already, 1,700 businesses are targeted to participate and our membership is growing every day. Money is flowing in and we are actively making funding commitments..

The infrastructure--springboard to bigger and better things--is in place. Across the province, 28 processing centres, where materials are sorted, processed and baled for shipment to markets, are functioning; retrofitting is going on so they can handle rigid plastic, containers, boxboards, and cardboard.

Ontario has the plant; it also has skilled recycling operators due to a training program jointly developed by the Environment Ministry and OMMRI.

We are also casting our gaze further afield. Meetings continue to be held with decision-makers in other provinces to discuss a national model. And requests for information on the "OMMRI Model" are coming from jurisdictions throughout the world.

The logic is clear. A large percentage of OMMRI members are national corporations which would welcome one set of rules across the country. A national approach means economies of scale and larger assured supplies of, and markets for, recyclable materials.

The need for a national approach was reinforced at a meeting that I attended recently. The organizers devoted a key session to packaging regulations and representatives of the different regions of Canada talked about how the issue is handled in their jurisdiction.

We heard spokespeople from the Maritimes, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and one who spoke from the federal perspective.

And let me tell you, it was a litany of woe, with one exception.

They spoke of deposits, depots, quotas and curbside recycling. And they spoke of the worst of all worlds...combinations of two or more of those alternatives. They spoke of waste, duplication, redundancy, quotas, limits to consumer choice and lack of logic. But particularly they spoke of high costs. High costs to society not just to industry. The cost of uncoordinated reaction to a real social need to change the way we deal with garbage.

The exception I mentioned a moment ago was Ontario. The Ontario spokesman considered the system here "a major success story."

But there is a fly in the ointment in Ontario right now. Recycling has been so successful that, on a North American wide scale, the supply of old newspaper has outstripped the demand. It's a temporary situation while industry scrambles to build new de-inking mills to absorb this material.

In the meantime, in response to this situation, a few municipal councillors have called for universal deposit systems.

Running a deposit system in conjunction with curbside collection is counter productive. Removing "high-grade" materials which have intrinsic value from the Blue Box causes the positive financial contribution from these containers to be lost, and operating costs to rise even further.

Clearly, we need to expand upon the success of the Blue Box program by adding materials and by increasing its average to apartments and rural households.

OMMRI's member companies will play a big role in that regard. In addition to putting up the $45 million, they are also implementing: purchasing practices which ensure recycled content; product and packaging design to minimize material weight and volume; promotion of recycling initiatives within their own organizations; and research and development into areas beyond their own packaging mandates, such as composting.

The Blue Box , to date, is only the beginning of the solution. There is a lot of work still to be done--no system can accomplish everything at once.

More materials will be added: rigid plastic, boxboard, cardboard, etc. and commercial and institutional recycling programs will follow.

In closing, let me just leave you with a couple of thoughts.

The first is that our system has been recognized and acknowledged at the very highest levels. Among other awards, those of us, OMMRI, the MOE and municipalities who made the Blue Box project happen, last year shared a United Nations environment award.

Second, if imitation is the sincerest form of flattery, we are much flattered. Jurisdictions on three continents--North America, Europe and Australia--are following our lead and implementing curbside recycling systems similar to the Blue Box program. Already ERRA, the European version of OMMRI, has comprehensive pilot projects underway in Dunkirk, France and Sheffield, England with others in the planning stages.

The Blue Box has developed the mindset that garbage is a problem and that each individual has a personal role to play in the solution. The Blue Box is a positive reinforcement for responsible waste management which will set the stage for significant waste minimization achievements to come.

Let's continue to build on its success..

ESTABLISHING A PLASTIC RECYCLING FACILITY

by

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"Do the Pioneers Catch All the Arrows?"

1.0 *Introduction*

Barring legislative intervention or the introduction of new, better materials not known at this time, studies indicate the use of plastics in all spheres of daily life will continue to grow significantly. The trend of using plastics to replace traditional consumer packaging materials will continue. In industry, plastics will continue to replace metal, glass, wood and other fabrication materials in many applications. As the advantages and opportunities from using plastics are expanded, the inevitable result will be an ever-increasing abundance of plastic waste.

1.1 *Plastic Recycling In North America In Context*

The environmental issue of the disposal of rigid plastic from consumer and industrial waste streams has been a subject of much discussion but little action for several decades. Although plastics makes up an average of approximately 7% of the municipal waste stream by weight, the volume fraction has been variously estimated at 18% to 38%. Efforts at minimizing plastic waste going to landfill, until recently, were restricted to those states and provinces which had adopted deposit systems for plastic soft drink and milk containers only. Typically, a few waste dealers bought this material and ground it up to be used in very low value-added applications such as winter coat fiberfill insulation or sold it as flake or pellets to plastics manufacturers. Due to the low profitability perceived to exist in this marketplace, a very low emphasis was placed on recycling plastic waste as a truly viable business.

The recent controversies over the lack of available landfill areas to bury consumer and industrial solid wastes and the public's uneasiness over the incineration of wastes has brought about an active program to divert reusable materials, including plastics, from waste streams to be recycled into new products. In addition, attention has also focussed on degradation technologies for waste reduction. However, there appears to be a growing consensus in the plastics industry against broad-spectrum application of degradation. Pressure is on governments to solve the solid waste disposal crisis; Metro Toronto's landfill sites are projected to be full before 1992. As a result, government pressure is mounting on the plastics industry to respond to the problem. In the United States, concern over plastic waste has resulted in state legislation banning the use of plastics in certain packaging applications, as well as inspiring a number of hastily conceived measures on disposable plastics.

The plastics industry has lagged badly behind others, including the paper and aluminum industries, with respect to efforts at recycling material. Much of the problem is attributable to the highly entrepreneurial but often technically unsophisticated nature of downstream plastics operations and because the early plastics recyclers came from non-plastics recycling backgrounds. The application of polymers expertise to improve reclamation technology and increase the value of recycled material has been generally inadequate. In fairness, broad community waste collection programs such as Ontario's Bluebox, a mechanism vital to the success of wide scale post-consumer plastic recycling, are a very recent phenomena.

The emphasis on plastic recycling through government pressure will increase dramatically over the next five years. In the United States ("U.S."), the Environmental Protection Agency's Solid Waste Strategy establishes a national goal of 25% recycling by 1992 and 50% by 1999, up from the current level of 10%. Ontario has established the goal of a 25% reduction in municipal wastes by 1992 and a 50% cut in municipal solid wastes by 2000. The recently announced Packaging Protocol has established the same year 2000 objective as Ontario. Major suppliers of packaging resins to the plastics industry have responded to the legislative and environmental imperatives by appointing high-profile, solid waste/recycling program managers, whether the company has started an active recycling program or not.

The Canadian Society of the Plastic Industry ("SPI") has formed waste management committees and subcommittees thereof to organize action on the environmental issues posed by plastic waste. The SPI has formed EPIC, ("Environment and the Plastic Institute of Canada"). EPIC's board of directors consists of high profile members of management from many major Canadian companies. The SPI has financed part of a study on Bluebox collections of rigid plastic carried out on a test basis in Ottawa in conjunction with the Ontario Ministry of the Environment ("MOE")and is currently jointly funding with the MOE a portion of the costs of a plastic film e.g. grocery bag collection trial via the Bluebox which is now underway in Peterborough.

Ontario has established a waste management funding program to provide financial assistance to waste management industry under the MOE's "3R's" waste program- Reduction, Reuse, Recycle. Assistance is available to perform feasibility studies, conduct research, purchase equipment and to finance plant commissioning activities.

1.2 *Key Elements To Successful Plastic Recycling*

There are five key elements to successful plastics recycling:

a) a continuous source of waste plastic material;
b) a collection infrastructure in place;
c) satisfactory reclamation technology;
d) end–use markets; and,
e) overall economic viability.

Very quickly, Ontario has become one of the leading recycling juriedictions in the world with the Bluebox recyclable waste collection program. Statistics indicate that the average Ontario household produces 20 pounds of rigid (i.e. non–film) plastic waste per year. Based on an MOE and SPI study recently concluded in Ottawa, the current anticipated annual collection rate of waste plastic material through Ontario's Bluebox program is estimated at about 50% of the plastic consumed, i.e. 10 pounds per household. Ontario has about 2 million Blueboxes in circulation in southern Ontario, translating into material available for recycling of 20 million pounds. This only scratches the surface of available recyclable waste plastic when other consumer and industrial sources are considered.

Very few organizations or companies world–wide have had the expertise, funding, technical support and experience to research and develop improved means of reclaiming plastic waste. The principal technical hurdles involve: a) developing an economical means of automatically separating co–mingled waste plastic resins; b) restoring and actually enhancing properties of reclaimed material; and of critical importance, c) creating an economically viable business by developing profitable products and markets for the recycled materials.

The long–term economic viability of plastic recycling must be founded on the ability to develop and maintain profitable products and markets for reclaimed material. Ideally, the applications developed would result in products that would not re–enter the waste stream.

The quest of properly focussed recycling should be on constantly improving profitability through increasingly value–added end–product applications. This is to avoid the dogfight that will inevitably occur as recycling evolves and recycled material becomes a major competitive commodity market. Having staff that are knowledgable and innovative in both polymer material science and recycled material markets is the single most critical factor to ensure a successful plastic recycling enterprise.

2.0 *The Plastic Recycling Oppportunity*

Polymer Developments Corporation ("PDC") was formed with the overall goal of creating a profitable, sophisticated and diversified plastic recycling operation in southern Ontario. We have identified major market opportunities and have selected proven technology and we possess polymers expertise that can pursue plastic recycling in Ontario successfully. We are conducting these activities through our wholly-owned subsidiary Resource Plastics Corp. ("RPC").

In order to establish an immediately economically viable plastic recycling business, on August 31, 1989 PDC acquired G.C. Plastics Inc.("GC") a new, growing Toronto-area plastics compounder. As a commodity resin compounder, GC reprocessed and upgraded scrap material for value-added sale to Toronto-area moulders for use in applications where prime resin material was not required. Of critical importance, GC provided access to an immediate, existing market sufficient to absorb the anticipated large volume of materials from post-consumer and industrial plastic waste sources. From GC, we acquired needed upgrading equipment in the form of extruders and mixers, plus staff already experienced in handling and cleaning mixed plastic scrap. After the acquisition, GC was renamed Resource Plastics Corp.

2.1 *Plastic Recycling Focus*

While much of the public's focus has been on the the Bluebox post-consumer plastic waste collection initiative, we concluded that major opportunities existed in recycling selected industrial plastic wastes. The distinguishing factor here is that we have targeted industrial plastic waste that is soiled or somehow contaminated, making it more difficult to conventionally reuse. Importantly, sufficient industrial corporate concern with respect to environmental issues now exists which is generating significant support for industrial plastic recycling initiatives. A number of corporations are now assisting by supplying us with waste which before was going to landfill. They are to be commended for their demonstrated commitment to the environment.

We are making an important announcement today. With the support and encouragement of EPIC, OMMRI, and the MOE, we herewith announce that we will immediately start the recycling of plastic wastes from Ontario's Bluebox recycling program. The Bluebox post-consumer waste collection mechanism is largely in place and Bluebox plastic collections are now expanding beyond just PET soft drink containers. In fact, our initial focus will be on the non-PET containers, but we are actively considering processing the PET as well. We are confident that based on the numerous Bluebox trials we have conducted, that we possess the requisite polymer materials and markets knowledge, processing technology, and end-product markets to enable profitable recycling of Bluebox waste plastics.

Since October, we have conducted trials on over 90 different kinds and sources of material, to determine which materials are the easiest for us to obtain, recycle, and sell profitably. In addition to Bluebox containers, we are establishing ourselves now as top-flight recyclers of soiled films, pails, drums, crates, etc.

2.2 *Plastic Recycling Operations*

Our Brantford facility, which we started buying equipment for in May 1989, and installing in October is just becoming fully operational now. Our plant has the capacity to process 34 million pounds of plastic waste per year. We have had our share of installation headaches, particularly with our wash plant which, I am told is typical of any major plant startup. I have been disappointed by the three month delay in getting up to speed; nonetheless, in our company's short existence, we have already established ourselves as a leading plastic recycler in North America.

We have selected proven, cost-effective equipment that provides the greatest flexibility in dealing with the waste plastic feedstocks that RPC has sourced for reclamation. For example, the film recycling equipment we have selected has an installed base of over 300 units worldwide. Also, the shred/separation/granulation/wash line, the first in North America, has been installed in more than one dozen plants in Europe processing a variety of feedstocks.

Our business is being developed in three phases, over a period of three years. We are currently in Phase I, which involves mastering basic waste plastic materials handling, reclamation and the sale of recycled, compounded materials to an existing molding marketplace. Phase II will emphasize material handling improvements, advanced material upgrading and niche end-product market development activities. In Phase III, we will concentrate on building the markets for selected end-use applications, while expanding the recycled/compounded materials business.

We are both obtaining scrap materials and selling them throughout North America. The border is proving to be a major hindrance to the growth of plastic recycling. For example, the paradox exists that if you send a bale of waste to Ohio it is not dutiable, but if you rejuvenate the material by cleaning and repelletizing, the material is subject to duties of generally around 7.5%. This duty succeeds in making our materials uneconomic in many situations. Any help available would be appreciated in this matter.

We already have a number of research projects underway: a project to use combinations of wood or paper with plastic wastes to make synthetic boardstock (U. of Toronto); a Bluebox resin separation project (U of Western Ontario); and, a project being sponsored by a petrochemical consortium, regarding the extraction of oil and pesticide residues from plastic containers (U of Waterloo). These projects involve little in the way of our money, time and effort at this point; we wanted to get the ball rolling now in these areas.

2.3 *RPC Management*

RPC's evident progress to date is based on the credibility and credentials of the persons involved in the operation. Mr. James T. Horn, P.Eng, is Chairman of Resource. Mr. Horn's major focus will be on business and product development and technical matters affecting all Resource operations. Mr. Horn has been active in the plastics industry at a senior level for nearly 41 years. Mr. Horn has a very broad base of polymers knowledge, and maintains invaluable worldwide industry contacts. Mr. Horn has worked extensively in marketing polymers and polymer products, as well as acting as a technical advisor to major plastic companies. Mr. Horn is a former member of the Board of Directors of the Society of the Plastics Industry ("SPI"), and is a member of the EPIC Waste Recycling Committee.

Mr. Douglas R. Winter, P.Eng, is President and Chief Executive Officer of Resource. Mr. Winter has been active in the plastics industry for 30 years. Mr. Winter has obtained excellent experience in the Canadian plastics raw materials business through working at Dow Chemical Canada, Shell Canada, A. Schulman Canada, and as a former major part-owner and President of Aclo Compounders Inc. Mr. Winter was a major force in building Aclo into the largest commodity resin compounder in Canada.

The speaker provides RPC with a wide range of financial skills and business experience including merchant banking, insolvency, computer consulting, and general public accounting.

3.0 *Summary*

The Society of the Plastics Industry, Canadian Plastics Institute and the Environment and Plastics Institute of Canada ("EPIC") are all fully supportive of RPC's skills and efforts. RPC has received widespread support from firms within the plastics industry as well. Our objectives are to help the plastics industry by promoting effective and responsible plastic recycling, aid the environment and society at large by reducing the volume of plastics going to landfill, while at the same time achieving our individual investment objectives. We are confident we will achieve these objectives, but we do request the cooperation of all concerned to help us in our endeavors.

I would like to take the opportunity to express our appreciation to the MOE who have provided us with capital financial assistance to establish our facility, and have encouraged individuals and companies with plastic recycling concerns to contact us.

As you may recall, I subtitled my presentation "Do the Pioneers Catch All the Arrows?". In response to that question, we have had our share of pioneering problems; we have learned by them. To make it all worthwhile, we are poised to grow spectacularly.

It has been my pleasure to provide you with this brief overview of plastic recycling and our activities with respect to establishing our plastic recycling facility. If you should have any questions please do not hesitate to ask.

BUILDING ON THE BLUE BOX - COMPOSTING THE NEXT STEP

by

Dan Hoornweg, Waste Management Co-ordinator,
City Engineer's Dept., Guelph, Ontario

The speaker reviewed his subject from notes based on a report currently in final preparation for issue at the end of the year. Those interested in obtaining a copy of the report are asked to write the speaker in care of the city's Engineer's Dept. at City Hall, 59 Carden Street, Guelph, Ontario N1H 3A1.

MANAGING INDUSTRIAL WASTES: A STRATEGY FOR THE '90'S

by

Richard F. Nowina, Director of Marketing, Ontario
Waste Management Corporation, Toronto, Ontario

When asked to make this presentation, I was initially reluctant for a number of reasons. First of all, it's difficult to be succinct when describing a broad-based waste management strategy. Secondly, because I'm relatively new to the Corporation, I'm still very much on the learning curve with respect to the programmes. And thirdly, I've discovered that many of OWMC's initiatives are like an iceberg, submerged and not readily apparent, but they're powerful none-the-less.

Starting with the challenges of its 1981 mandate, OWMC has selected its site, defined the issues, completed the Environmental Assessment and both entered the Hearing phase and begun to provide assistance to industry through Waste Reduction activities. These are major accomplishments. With these foundations laid, we are now focusing on how we can further serve Provincial needs.

In our opinion, the service infrastructure providing hazardous waste management assistance to householders and industry needs to be strengthened and we are looking at ways we can assist.

Today, I'm going to outline my views of the role the Corporation will play in two specific areas; first, in developing a province-wide system for managing liquid industrial and hazardous waste, and second in stimulating the demand for environment-related goods and services. My message is this: as a public agency, OWMC is guided by the basic objective to provide assistance to anyone involved in the issue of hazardous waste management.

But, beyond OWMC's specific programs, if we as a society are to ensure our future prosperity and well-being, we must make radical progress soon in changing individual and group behaviour in both how we consume and how we accept responsibility for our lifestyle.

Much has been said and written about the general deterioration of our air, water and soil. However, we're not taking enough time to understand the connection between our current lifestyles and the environment we will pass on. We continue to see examples of irresponsible consumerism as well as shortsighted enthusiasm for disposable conveniences.

In the 1989 Ontario Hydro Annual Report there are numerous references to the environment. One in particular illustrates my point. The report quotes a study that says 89% of Canadians are concerned about the environment. However, 78% of the respondents have made no change to their lifestyle to protect the environment.

I experience my own difficulties. A few weeks ago, I had the oil in my car changed at a major service station. My choices included a package of recycled oil. When I selected this package, I was cautioned against the choice because the recycled oil was not as good as new oil. Despite this, I ordered the recycled oil, but I wondered how many others are discouraged from doing likewise.

These examples illustrate a number of points. First, we are only beginning to pay any real attention to environmental management at the personal level. It was a considered decision for me to select the recycled oil. However, many products we buy already contain recycled materials and there is no distinction made - scrap steel and aluminum in cars for instance. As a matter of interest, BMW in Germany has announced a plan to test recycling of cars. They will take 1500 old BMW's and dismantle, segregate and recycle car constituents to evaluate costs and benefits of doing so.

Secondly, the service station attendant truly believed that the recycled oil was inferior to the new. In this aspect, we have a lot to learn from successful antique dealers.

And, finally, the incident demonstrates that environmentally responsible products are still a rarity and offer a tremendous marketing opportunity. Indeed, any products or services related to resource conservation and environmental protection are beginning to nudge disposables out of the marketplace as aware consumers make more considered choices.

This is the milieu in which OWMC is shaping its destiny. I believe we have already made a substantial contribution through our waste reduction initiatives and analytical services. We're well-known for our pioneering efforts to comply with the environmental assessment process required for the treatment and disposal facility we plan to build in the Township of West Lincoln.

We are less well-known for the breadth and quality of the information we have assembled in doing that work. These volumes of research data and conclusions are being examined in the Joint Board Hearings that are currently underway under the Consolidated Hearings Act.

In the course of documenting the treatment capacity in the province, we identified many market opportunities. Our environmental assessment contains analyses and forecasts which others can use to assist in making decisions about entering or expanding in the hazardous waste management marketplace. Our reports describe the types and quantities of industrial waste produced, sources of waste and where they are presently going, and give forecasts in each of these areas. Our projections of demand for additional, off-site treatment capacity invite the development of additional facilities.

We have documented waste management activities with potential for value added services such as specialized containers, transfer stations, and 3R's. All of these activities are expected to play an expanding role in managing the demand as regulations capture a larger number of waste streams and require higher levels of treatment.

As well, our environmental assessment of the selected site has generated approximately $50 million in business for experts in fields ranging from archaeology and hydrogeology to air dispersion and social impact studies. This is one of the most comprehensive environmental assessments ever conducted and puts Ontario's consulting firms on the leading edge of their respective fields, not only in Canada but around the world.

Our research into facility design has generated a wealth of information on treatment technologies. As well, we will be spending more than $300 million to build the treatment and disposal facilities. That is - if they are approved, and much of the technology will be sourced here in Ontario. Meanwhile, other business opportunities exist now in areas such as research and design, manufacturing, and distribution of a wide range of environmental technologies.

As a result of the efforts of OWMC and others to develop solutions, everyone who wants to now knows more about the industrial waste treatment marketplace than they did just a few short years ago. Yet, more needs to be done before we will have as clear a view of the marketplace as the automotive or pharmaceutical industries have of theirs.

Industries now know more about the wastes they are generating and about effective reduction and treatment options. Recyclers can find opportunities for obtaining more of the wastes they can best treat. Haulers and transfer station operators can determine what wastes are being sent off-site, and they can now forecast more accurately the potential for their business when treatment standards are changed.

The entry into the marketplace of the OWMC treatment facility, properly sized to avoid establishing a monopoly or inhibiting the continued drive for waste reduction, will help everyone.

With OWMC's facility in place, regulations can be set to increase the treatment requirements for the volumes of waste that are presently receiving little or no treatment at all. Increased treatment requirements will involve more generators subject to Regulation 309 and a wider variety of residues for recycling or treatment.

This means there is a broad opportunity to create niches of value-added services. It is important to remember our fundamental objective at OWMC is to act as the cornerstone for public policy on industrial waste management issues by providing assistance to any party with an interest in hazardous waste management.

We can provide this assistance in three basic ways:

- first, by disseminating information that others can act upon. OWMC's market information programs will make reports available that will help the private sector respond to gaps in service;

- second, by entering into joint ventures with the private sector to assist the development of a stronger service infrastructure;

- third, by sponsoring programmes which have uncertain economic benefits but clear environmental benefits.

Four principles will guide us in implementing this service strategy.

First, we acknowledge the role of the existing waste treatment industry. All our projections show that business for the private sector will be stimulated by the existence of our facility and by our waste reduction emphasis. It is our role to assist this process. The planning program to enhance the collection and transfer of waste in the province was included in our environmental assessment and clearly illustrates our preference that the private sector develop these services.

Secondly, we recognize that our facility is not an exclusive solution to the problem of hazardous waste. There are many other areas such as legislation, enforcement, financial incentives, education, technology development and the whole infrastructure of services that play a critical role. Our facility will be simply a tool to aid public policy in hazardous waste management.

Thirdly, and most importantly, although it may have appeared otherwise over the past several years because of the high profile of our facilities development process, work in the area of the 3Rs is a core activity for OWMC. Our existing programs encourage waste reduction through education, sponsor research and development and stimulate the reuse and recycling of chemical wastes. Our monthly Waste Reduction Seminars, held throughout the province, emphasize a mass balance approach to auditing waste generation and setting priorities for waste reduction activities. Since 1986, we have jointly funded, with the Ministry of the Environment, the Ontario Waste Exchange, which puts waste generators in touch with potential secondary users. Recently we've seen an explosion of demand for this service. We intend to devote even more resources and focus even more attention in the 3R's area.

And finally, we intend to use our pricing policies to continue to encourage wastes minimization to the extent possible. We will provide assistance and commit resources to small volume generators, especially those in remote areas, to assist them in developing an efficient and cost-effective plan for the treatment of their wastes. Generators will need various levels of assistance to ensure their wastes receive adequate treatment and proper disposal. Our assistance will draw upon technology suppliers and the existing collection and transfer industry throughout the province.

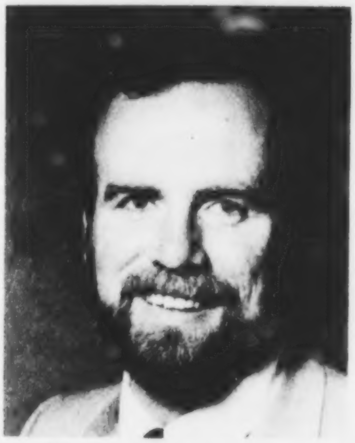
We expect innovators to apply more effort to reuse and reduction options than is apparent to date. The current lack of progress is due partially in my view to the lack of concrete evidence of the rewards for such efforts. Since most hazardous wastes are used or contaminated raw materials dispersed throughout our industrial base, there is low potential value. As more of these materials begin to be documented, collected and shipped to a central location, innovators will recognize their potential value.

This is a capsule view of OWMC and its anticipated effect on the waste management marketplace. I may have raised more questions than I've answered. But I do want to alleviate any concern that OWMC intends to monopolize the treatment of hazardous waste and I do want to focus attention on the opportunities resulting from OWMC's work to date and the potential for the future.

It's clear that we are not experiencing a passing infatuation with the environment. We are experiencing a fundamental change in public attitudes and political commitment. Consumers are becoming more discriminating in their purchases and are demanding greater environmental responsibility on the part of government and industry. Both will pay the ultimate price for any lapse in attention to this issue. Governments and industry generally recognize that the costs of waste reduction and proper treatment are much less than the price of failure to comply with regulations. As environmental regulations become increasingly strict, waste management costs will continue to have a high impact on profit. But, on the other hand, the service opportunities and a strong demand for a broad range of environmental goods and services will make a significant contribution to Ontario's economy.

We ignore at our peril our environmental responsibilities, and we ignore at our peril the potential for leadership and prosperity in an evolving service activity.

SESSION V — WATER QUALITY MANAGEMENT



Moderator: Robert Pickett
President, Pollution Control
Association of Ontario, Toronto

Edward W. Turner, Manager
MISA - Municipal,
Water Resources Branch
Environment Ontario, Toronto

Professor J.A. Cherry, Contaminant
Hydrogeology
University of Waterloo,
Waterloo, Ontario

Dr. Warren Flint, Associate Director
Great Lakes Program,
University of Buffalo,
Buffalo, New York

MUNICIPAL/INDUSTRIAL STATUS OF MISA PROGRAM

by

Edward W. Turner, Manager, MISA-Municipal,

Water Resources Branch, Environment Ontario,

Toronto

The author presented the two MISA papers listed on the Conference program - Municipal and Industrial.

He spoke to a series of slides and overheads which follow.

Those interested in further details on these subjects, are asked to contact the author direct at the Ministry.

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MUNICIPAL/INDUSTRIAL

STRATEGY FOR

ABATEMENT

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GOAL

WHITE PAPER, 1986

“The virtual elimination of toxic contaminants in Municipal and Industrial discharges into waterways”

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HOW TO ACHIEVE GOAL

- successive application of technology-based discharge limits
  "BATEA LIMITS"

- applied to all direct discharges
  - municipal STP's
  - industries (9 sectors)

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MISA MUNICIPAL PROGRAM

OVERVIEW

Two components:

❶ control of STP discharges

❷ municipal enforcement program

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STP CONTROL PROGRAM

Four components:

❶ monitor for one year:
  - STP influent
  - STP effluent
  - sludges

❷ develop limits regulations (JTC)

❸ compliance monitoring by municipalities

❹ abatement for non-compliance

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STP CONTROL PROGRAM (cont.)

- Regulation to apply in two phases:
  - Phase 1
    - all mechanical systems and STP's with >1mgd flow
    - approx. 215 STP's in 150 municipalites
  - Phase 2
    - others
    - approx. 180 STP's

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BACKGROUND INFORMATION

DISTRIBUTION OF STP'S (1988)

CATEGORY	MOE OPERATED	MUN. OPERATED	TOTAL
1. STP'S with no surface water discharge	9	9	18
2. Seasonal & annual discharge lagoons	86	26	112
3. Continuous discharge lagoons & mechanical biological plants	136	120	256
4. Primary plants	8	21	29
	239	176	415

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CONCERNS WITH STP PROGRAM

- Need for pre-monitoring?
- Lengthy schedule of program
- Cost of compliance
- Need for phasing on priority basis

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COST OF COMPLIANCE

- ☞ If adopt U.S. EPA limits of:
  - ☞ BOD - 30 mg/L
  - ☞ SS - 30 mg/L
  - ☞ Tot. P - 1 mg/L

		$million
☞ Upgrade 27 of 29 primary plants	=	650
☞ Upgrade of 8 secondary plants	=	100
Sub-total		750
☞ Compliance Monitoring	=	50
Total		800

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BURDEN OF COST

- Using existing MOE grant formula:

  $million
  - cost to municipalities = 540
  - cost to MOE (35% capital cost) = 260

- Can municipalities afford this level of expenditure?

- Will more government funding be made available?

- What is cost burden of homeowner?

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STP PROGRAM SCHEDULE

- develop draft regulation - 1990
- promulgate regulation - 1991
- compliance - 10 - 20 years?

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MUNICIPAL ENFORCEMENT PROGRAM

Two components:

1) sewer use control program (MOE regulation)

2) MOE "BATEA" regulations for 22 industrial/ commercial sectors

Ref: "Controlling Industrial Discharges to Sewers", Sept., 1988

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PRINCIPLES OF MEP

- control at source
- municipal sewer use bylaw
- "BATEA" effluent limits
- enforcement by municipalities
- self-financing program
- public participation

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REQUIREMENTS FOR MUNICIPALITIES

- develop & implement program
- inspect discharges
- audit discharges
- enforce
- report to MOE

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REQUIREMENTS FOR INDUSTRIES

- pretreatment to bylaw or BATEA limits
- BMP's
- self-monitoring
- reporting to municipality

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MUNICIPALITIES IN PROGRAM

- municipalities with:
  - population > 10,000, or
  - STP flow > 4546 cu. meters/day
- other municipalities with problems due to industrial discharges

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PROPOSED FUNDING FOR MUNICIPALITIES

- 50% program development costs
- 33% capital costs
- no funding for implementation of program

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MUNICIPAL ENFORCEMENT PROGRAM

Demonstration projects

- Hamilton-Wentworth
- Thunder Bay
- Cobourg
- Ingersoll
- Gananoque

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SEWER USE CONTROL PROGRAM

COMPONENTS:

- SEWER USE BY-LAW
  REF: MOE MODEL BY-LAW, 1988

- SAMPLING AND ENFORCEMENT
- HAULED WASTES
- LOCAL LIMITS
- SPILLS AND BMP'S
- CONTROL INSTRUMENTS
- REPORTING

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BATEA REGULATORY PROGRAM

- sampling of discharges to sewer
- development of sector effluent limits through "JTC" consultative process with:
  - industry (trade associations)
  - municipalities (MEA/AMO)
  - MISA Advisory Committee
  - Environment Canada
- development of regulations to be staged over 2-3 year period

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MISA BATEA INDUSTRIAL SECTORS

- METAL FABRICATION
- ORGANIC CHEMICALS
- WASTE TREATMENT & RECYCLING
- PRIMARY METAL
- NON-FERROUS METALS
- INORGANIC CHEMICALS
- ELECTRICAL & ELECTRONIC
- PULP & PAPER
- PETROLEUM
- TEXTILE MILLS
- LEATHER TANNING

CONTINUED...

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MISA BATEA INDUSTRIAL SECTORS

- TIMBER PRODUCTS
- INDUSTRIAL LAUNDRIES
- RUBBER & RUBBER PRODUCTS
- HOSPITALS
- FOOD INDUSTRIES
- AUTOMOBILE MANUFACTURING
- EQUIPMENT MANUFACTURE
- STONE CLAY & CEMENT
- SERVICE INDUSTRIES
- PRINTING & PUBLICATIONS
- TRANSPORTATION
- SID'S

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MEP COORDINATION & TRAINING

- MEP COORDINATION
- TRAINING
- DATA BASE MANAGEMENT

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SEWER USE TRAINING COURSES

- ENVIRONMENTAL LAW
- SAMPLING, MONITORING & INSPECTION OF INDUSTRIAL DISCHARGES
- SPILLS (TO THE SEWER SYSTEM)
- LOCAL LIMITS DEVELOPMENT
- INDUSTRIAL WASTE TREATMENT
- CONTROL INSTRUMENTS

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SCHEDULING

1) SEWER USE CONTROL PROGRAM
   - MOE SEWER USE CONTROL REGULATION; FALL 1991
   - MUNICIPAL ENFORCEMENT; FALL 1992

2) BATEA REGULATIONS
   - COMMENCE DEVELOPMENT FOR 6 SELECTED SECTORS - 1992
   - PROMULGATION; LATE 1993

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MISA PROGRAM

INDUSTRIAL SECTION

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GOAL OF MISA PROGRAM

- virtual elimination of persistent toxics

- two phase program:
  1) effluent monitoring
  2) effluent limits regulations

- ten sectors:
  - Petroleum
  - Organic Chemical
  - Inorganic Chemical
  - Iron & Steel
  - Pulp & Paper
  - Mining
  - Metal Casting
  - Electric Power
  - Industrial Minerals
  - Municipal STP's

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MISA PROGRAM IMPLEMENTATION

- regulations to be developed with full consultation of industry and municipalities
- vehicle to be Joint Technical Committees (JTC's)
    - MOE
    - Industry
    - Environment Canada
    - MISA Advisory Committee (MAC)
- MAC independent body of environmental experts appointed by Minister to advise on adequacy of regulations

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MONITORING REGULATIONS

STATUS

SECTOR	COMPLETION
PETROLEUM	COMPLETE
ORGANIC	OCT 1990
IRON & STEEL	NOV 1990
INORGANIC	DEC 1990
PULP AND PAPER	JAN 1991
MINING	FEB 1991
METAL CASTING	MAY 1991
ELECTRIC POWER	JUN 1991
INDUSTRIAL MINERALS	AUG 1991

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DEVELOPMENT OF LIMITS REGULATIONS

- limits to be developed jointly by MOE and industry through JTC approach
- conceptually simple:
  - apply "BATEA" to monitoring data
- many issues to be resolved within this simple concept before limits can be developed

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ISSUES

1. **Monitoring Data**

- ✓ analysis of data
- ✓ analysis of QA/QC data
- ✓ gross vs net loadings

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ISSUES (continued)

2. Best Available Technology Economically Achievable

- ✓ determination of 'BAT'
- ✓ assessment of 'EA'
- ✓ determination of Best Management Practices

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ISSUES (continued)

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3. Limits

- ✓ definition of virtual elimination
- ✓ selection of candidate parameters for limits
- ✓ flow measurement accuracy requirements under limits
- ✓ form of limits
- ✓ how to set limits
- ✓ compliance with limits
- ✓ periodic review of limits
- ✓ listing/delisting of parameters

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ISSUES (continued)

4. Toxicity

- ✓ setting of toxicity limits

5. General

- ✓ control of storm water
- ✓ control of emergency overflows
- ✓ reporting of information to public

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MONITORING DATA ANALYSIS

- distribution of data
    - normal
    - log normal, etc.
- averaging
    - concentration
    - loading
- how to deal with outliers
- confidence limits
- variability factors
- sector, sub-sector, plant or business unit basis

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QA/QC DATA ANALYSIS

- how do we interpret QA/QC data?
  - field QA/QC
  - laboratory QA/QC
- how do we modify monitoring data with respect to QA/QC data?

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SELECTION OF BAT

✳ current status of technology at Ontario plants

✳ world-wide review of operating technologies

✳ list of parameters for each BAT

✳ does BAT apply to sector, sub-sector, plant or business unit?

✳ quality of data used to evaluate BAT

✳ rules for selection of BAT

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ECONOMIC ACHIEVABILITY

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$ age of plants or units

$ total cost of applied BAT including secondary operating costs
    $ eg. sludge disposal

$ cash flow of plants, business units, etc.

$ implementation timetable vs. cost

$ socio-economic assessment

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SELECTION OF PARAMETERS FOR LIMITS

- frequency of occurence in monitoring data
- level
  - mass loading/concentration
- availability of information on BAT related to parameter
- use of surrogate parameters
- U.S. EPA Regulations
- rules for removal of a parameter from consideration

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FORM OF LIMITS

- what form?
  - concentration
  - loading
  - loading/unit production

- per effluent pipe

- per plant

- sector specific characteristics
  - eg. mining

- regulation document/Certificate of Approval/permit

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LIMIT SETTING

- parameter data base
- priorities on parameters
- which effluent streams will be controlled?
- type of limit:
  - daily maximum
  - monthly average
  - concentration or loading

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COMPLIANCE

- ▼ need to develop compliance criteria
  ie. ▼ what is compliance?
      ▼ how many times, if any, can limit be exceeded in a given time-frame?
- ▼ consideration of significant vs. non-significant non-compliance
- ▼ reporting of non-compliance

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TOXICITY LIMITS

- which test?
  - pass/fail
  - LC50
- which aquatic species?
  - rainbow trout, etc.
- analysis of toxicity monitoring data
- which effluent types will be controlled?
- frequency of testing
- what constitutes non-compliance?

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ISSUE RESOLUTION PROCESS

- ISSUE RESOLUTION COMMITTEES (5)
- MEMBERSHIP
  - MOE
  - INDUSTRIAL
  - MUNICIPAL
  - ENVIRONMENTAL
  - MISA ADVISORY COMMITTEE
- CHAIRPERSONS FROM MOE

MISA

ISSUE RESOLUTION PROCESS
(CONT)

- TWO MOE ISSUE RESOLUTION COORDINATORS
- MOE WORKING GROUPS
  - GROUP LEADERS FROM MISA OFFICE
- MOE INTERNAL ISSUE RESOLUTION STEERING COMMITTEE
- MOE INITIAL POSITIONS
  - RELEASED END OF MARCH / EARLY APRIL
- INDUSTRY INITIAL POSITIONS

-1

MISA

ISSUE RESOLUTION PROCESS
(CONT)

- WHERE NO DIFFERENCES - RESOLVED
- WHERE DIFFERENCES - DISCUSSION & NEGOTIATION
- MOST CASES - AGREEMENT REACHED
- SOME AREAS - DIFFERENT POSITIONS

UNRESOLVED AREAS

MISA

VIRTUAL ELIMINATION:

- INDUSTIAL DEFINITION IS THE "ACCEPTABLE LEVEL" AT WHICH THERE IS NO FURTHER "ADVERSE EFFECT" ON THE AQUATIC ECOSYSTEM OR HUMAN HEALTH

ECONOMIC ACHIEVABILITY:

- INDUSTRY CONTENDS THAT JTC'S SHOULD CONSIDER PUBLIC BENEFITS

MISA

UNRESOLVED AREAS
(CONT)

NET LOADINGS:

- INDUSTRY CONTENDS THAT CALCULATED NET LOADINDS SHOULD BE PUBLISHED

- INDUSTRY CONTENDS THAT THERE SHOULD BE AUTOMATIC COMPLIANCE WHERE NON-COMPLIANCE IS DUE TO HIGH LEVELS OF INTAKE CONTAMINENTS

24

MISA

UNRESOLVED AREAS
(CONT)

MONITORING FOR ASSESSMENT:

- INDUSTRY ARGUES THAT ONCE-PER-YEAR MONITORING FOR THE FULL EMPPL IS ADEQUATE
  (MOE POSITION IS TWICE / YEAR)

2-5

MISA

UNRESOLVED AREAS
(CONT)

STORM WATER:

- INDUSTRY WANTS CONSIDERATION OF OFF-SITE STORM WATER QUALITY WHEN ASSESSING THE NEED FOR FURTHER ACTION

BY-PASSES:

- INDUSTRY CONTENDS THAT BY-PASSES SHOULD BE ALLOWED IN SITUATIONS OTHER THAN THOSE SPECIFIED BY THE MINISTRY

BMP'S:

- INDUSTRY DOES NOT WANT APPROVAL OF BMP'S TO BE REGULATED

MISA

UNRESOLVED AREAS
(CONT)

COMPLIANCE:

- INDUSTRY DOES NOT FAVOUR INTERIM LIMITS DURING THE THREE YEAR "BAT" PERIOD
- INDUSTRY PROPOSES A SELF-MONITORING CONTROL PLAN TO BE IMPLEMENTED WITHIN 6 MONTHS

2.

MISA

UNRESOLVED AREAS
(CONT)

REPORTING:

- A MUTUALLY ACCEPTABLE PROCESS FOR DETERMINING CONFIDENTIALITY OF MISA DATA AND INFORMATION
- INDUSTRY CONTENDS THAT REPORTS SHOULD DIFFERENTIATE BETWEEN ENVIRONMENTAL NON-COMPLIANCE AND REGULATORY PROCEDURAL DEVIATIONS
- INDUSTRY CONTENDS THAT REPORTS SHOULD COMPARE INDUSTRIAL DISCHARGES TO OTHER DISCHARGES
  (MUNICIPAL, AGRICULTURAL, U.S. COMPANIES)

7.5

MISA

FINALIZATION

- DRAFT ISSUES REPORT TO BE REVIEWED BY MAC, ENV.CAN., INDUSTRY, MUNICIPALITIES AND THE PUBLIC
- MINISTER WILL CONSIDER INPUTS AND MAKE FINAL DETERMINATION
- PROCESS EXPECTED TO BE COMPLETED IN AUGUST

GROUND WATER PROTECTION: PHILOSOPHY AND APPROACH

by

Professor J.A. Cherry, Contaminant Hydrogeology,

University of Waterloo, Waterloo, Ontario

At the time of assembly of the Proceedings for printing, a text of the author's paper was not available to include in numerical sequence.

If the paper was subsequently received, it is incorporated in these Proceedings following the listing of the Conference Delegates.

Otherwise, those wishing further details on this subject are asked to contact the author direct at the University of Waterloo.

HUMAN HEALTH RISKS FROM CHEMICAL EXPOSURE: THE GREAT LAKES BASIN ECOSYSTEM

by

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Buffalo, New York 14260 USA

ABSTRACT

The Great Lakes are an immeasurably important resource, representing the economic and social lifeblood of many peoples in both Canada and the U.S. The Great Lakes ecosystem has been used by society for centuries and has been impacted by man in a variety of ways. For example, the continued introduction of long-lived toxic chemicals from waste disposal practices in the Great Lakes is an issue that is actively discussed today and one of the greatest concerns in these discussions is hazards to human health. To set the stage for discussion on an approach to problems associated with toxic contamination in the Great Lakes, this paper presents background information on past records of toxic chemical pollution in the water and the biota in these Lakes by drawing on extensive data available for Lake Ontario. Basic mass-balance information is also presented demonstrating the persistence of these toxic chemicals in the Great Lakes environment.

Building upon available background information on toxic chemicals in the Great Lakes Basin ecosystem, this paper goes on to describe a process that facilitated the coming together of a variety of talents to collectively deliberate on issues surrounding the question of human risk to toxic chemical exposure. Based upon present evidence, environmental toxicologists believe that the major route of human exposure to toxic chemicals in the Great Lakes Basin is through the dietary ingestion of fish, turtles, and birds. The primary conclusion drawn by experts from a number of different disciplines that deliberated the facts was that persistent toxic chemicals, due to their nature, pose threats to the health of individuals within the Great Lakes Basin.

The regulatory process has the ability to reduce potential threats to society now by all jurisdictions developing common standards for water quality, sediments, and fish body burdens, while ensuring full compliance with existing laws. Discussion is presented on the need for a total ecosystem approach demanding an expanded monitoring and assessment system for the Great Lakes capable of establishing the chemical, physical, and biological effects of toxic substances. This expanded capability is essential to identify pollution trends, their attendant causes, and when linked with mass balance modeling, appropriate preventive or remedial measures designed around sound allocation strategies.

The regulatory process alone, however, may be unable to address or resolve all identified problems. Therefore, there is a need for governments to develop and promote incentives that induce changes in the economic structure, towards a system of economy that promotes and enhances harmony with the ecosystem and incorporates value systems. This paper goes on to discuss thoughts that might address these needs in the form of a new way of doing business in the Great Lakes Basin.

HUMAN HEALTH RISKS FROM CHEMICAL EXPOSURE: THE GREAT LAKES BASIN ECOSYSTEM

INTRODUCTION

The Great Lakes are an immeasurably important resource. They are ecologically important in their own right in providing a home for many species and serving as one of the greatest reservoirs of fresh water in the world, with all its hydrological, meteorological, geological, and biological implications. These Lakes are also the economic and social lifeblood of many peoples in both Canada and the U.S. They provide drinking and irrigation water, fisheries and wildlife habitat, transportation, power, processing water, recreational opportunities, aesthetic pleasure, and many other uses to humans living in and outside the Basin.

The Great Lakes ecosystem has been used by society for centuries and has been impacted by man in a variety of ways. These Lakes have experienced a diversity of perturbations to their natural function which include excessive nutrients, influx of toxic contaminants and the restructuring of fish communities through both exotic invasions and purposeful stocking. Clean, usable water resources are an essential element in the quality of life which makes the Great Lakes region an attractive place to live and do business. Toxic contamination and excessive nutrient loading are threats to this quality of life. What our generation must now realize is that, what we are doing to the Great Lakes, we are doing to ourselves as well as to our children.

The continued introduction of long-lived toxic chemicals from waste disposal practices in the Great Lakes is an issue that is actively discussed today. One of the greatest concerns in these discussions is the hazards to human health. Knowledge on the topic of human health risks associated with toxic chemical exposure is fragmented and incomplete. In addition, scientific disagreement on this issue contributes to public confusion regarding the risk to living in the Great Lakes Basin.

Reduction of anthropogenic loadings of toxic chemicals is a major thrust in current management of the Laurentian Great Lakes. Understanding the relationship between all identifiable forms of input and the fate and distribution of these chemicals in the ecosystem is a key component. If pathways and processes of material movement are not understood, and related to man's activities, it is impossible to make learned judgments about the risks of particular actions or resource exploitations. Until our knowledge of processes is increased substantially, however, the uncertainty of which management strategies to apply and what results to expect from a given strategy, or combination of strategies, will remain high. The only way to reduce uncertainty is to improve understanding, first through synthesis and integration of existing information and secondly through new research at the most creative levels possible.

CONTAMINANTS TRENDS

Of all the Great Lakes, Lake Ontario provides the best record on toxic chemical trends and distributions because of the extensive studies conducted on this system over the last twenty years. Sediment profiles of PCBs, mirex, chlorobenzenes, chlorotoluenes, octachlorostyrene, and hexachlorobutadiene all exhibit a pattern suggesting that peak concentrations generally occurred in Lake Ontario during the early 1960s with fairly rapid declines occurring shortly thereafter, both in response to declines in production and, presumably, in response to more stringent effluent controls (Oliver and Nicol 1982; Eadie, et al. 1983; Durham and Oliver 1983).

During recent years researchers have concentrated on sources and mechanisms involved in contaminant transport and distribution in Lake Ontario. Results of these studies have contributed to our understanding of processes affecting contaminant dynamics. It is clear that contaminants will persist in the lake environment for decades, even if all point sources were eliminated now. For example, Mirex and PCBs are no longer being manufactured or used, but they continue to be measured in sediments and fish.

How persistent are these toxic contaminants in the Lake, even after discharge has ceased? A mass-balance approach is a good means of accounting for materials over time. Mass-balance modelling tracks material entering and leaving the lake by various pathways and indicates persistence of the materials following implementation of control processes. The disadvantage of a mass-balance approach for tracing the movement of materials through lakes is one of data availability. Knowledge is required on input sources and rates, residence times, partitioning factors, and ultimate fate paths of the materials in question. Unfortunately there are very few toxic contaminants for which all of these data are available.

A possible exception may be mirex. For this particular chemical there is a relatively good estimate of the amount that entered Lake Ontario over a specific time period (Holdrinet, et al. 1978). Measurements have been made of concentrations in various components of the system (e.g., sediments and biota) that serve as pools for this contaminant in the ecosystem (e.g., Whittle and Fitzsimons 1983; Eadie, et al. 1983). In addition, projected loss of mirex to Lake Ontario via outflow of the St. Lawrence River has been estimated (Halfon 1984). Probably most importantly, there are presently no known sources of mirex to Lake Ontario and therefore, in using a mass balance approach in determining dynamics of transport for this chemical and predicting long-term persistence one can assume an input event of limited and defined duration.

The following initial conditions and assumptions were set for the Lake Ontario to estimate the persistence of mirex in the system using a mass balance approach. Holdrinet, et al. (1978) estimated that 688 kg of mirex were dumped into the Niagara River from the late 1960's through 1976. Another source of mirex was identified and described from the Oswego River in New York State (Scrudato and DelPrete 1982). Sediment concentrations for mirex offshore of the Oswego River (10 ng/g) were observed to be similar to mirex sediment concentrations offshore of the Niagara River (Scrudato and DelPrete 1982; Thomas 1983). Therefore, it was assumed that a load of mirex was discharged into the Oswego River similar in mass to the amount discharged into the Niagara River. Based upon this assumption, it was estimated that a total loading of 1.3×10^6 grams of mirex was input to the Lake Ontario system over a time span of 10 years (1966-1976).

Halfon (1984) calculated that approximately 8% of the total mirex load leaves the system via the St. Lawrence River annually. By 1980 it appeared as though two thirds of the mirex in Lake Ontario was buried in sediments 6 cm deep (Eadie, et al. 1983), deep enough to be unaccessible to burrowing benthic invertebrates. From these measures it was estimated that 6.6% of the total mirex entering Lake Ontario was lost to sediment burial on an annual basis. The other major loss of mirex from Lake Ontario is through the food web (Flint, *et al*. 1987) and ultimately removal from the system by harvest of fish. Mean concentrations of mirex in depositional basins of Lake Ontario equal approximately 0.02 ug/g (Thomas 1983). Uptake of mirex by the benthos based upon body burden measures for the amphipod, *Pontoporeia hoyi* (Whittle and Fitzsimons 1983; Flint, *et al*. 1987) equal approximately 0.2 ug/g. Lake Trout body burden concentrations of mirex have varied from 2.5 ug/g (d.w.) in 1977 to 1.0 ug/g (d.w.) in the early 1980's (Whittle and Fitzsimons 1983). We can use the range of fish body burden amount (based upon Lake Trout measures) coupled with known harvest of fish from Lake Ontario to estimate the amount of mirex removed from the Lake by fishery harvests annually. Based upon the 1977 mirex body burden measures for Lake Trout (2.5 ug/g) and annual average fishery harvest of 4.086×10^9 g (wet wgt.), the annual mirex removal rate by fish in 1977 equalled 2.0×10^3 g. In 1982 the mirex body burden was estimated to be 1.0 ug/g for Lake Trout and combined with an annual harvest rate of 4.086×10^9 g, it was estimated that 0.82×10^3 g of mirex were removed annually in the 1980's through fish harvest.

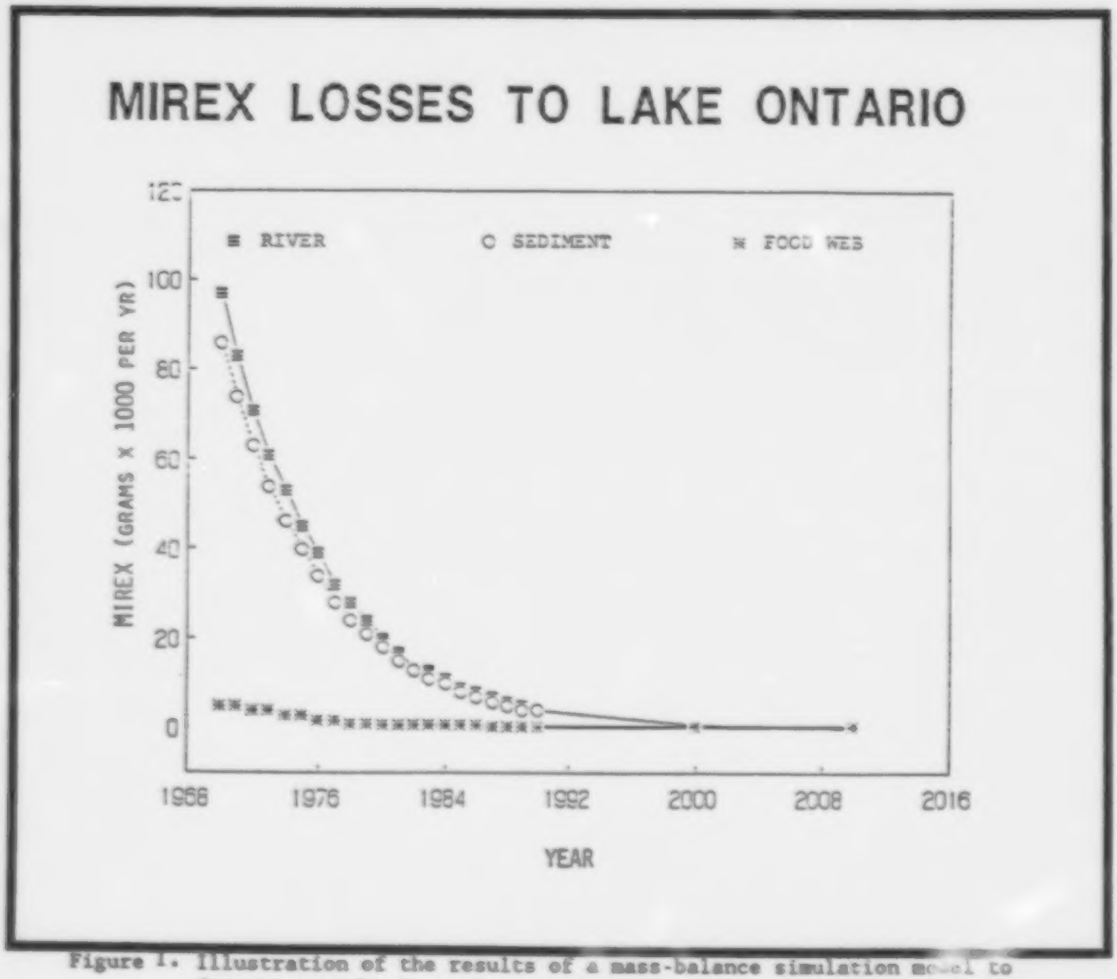

Figure 1. Illustration of the results of a mass-balance simulation model to demonstrate the loss of mirex from the Lake Ontario ecosystem over time, assuming no new sources of mirex to the Lake.

Using the initial mirex source amount of 1.3×10^6 g and the annual rates of transfer and loss to various system compartments, a mass balance model was developed. The model was used to project the rate of decay for mirex in Lake Ontario (assuming no new sources) and the amount of time for total decay to occur. The results of this simulation are presented in Figure 1. An exponential decay of mirex is exhibited for loss due to sediment burial and loss via St. Lawrence River outflow. The fishery harvest loss rate is displayed as a constant over time with a slight change between 1970 and 1980 due to changes in body burden measures between 1977 and 1982 (Whittle and Fitzsimons 1983). Based upon this simulation (Figure 1), in 1970 it was assumed that Lake Ontario contained a total of 1.3×10^6 g of mirex. In 1987 the model indicated that a total of 7.6×10^4 g of mirex remained in Lake Ontario and that the rate of removal by sediment burial and St. Lawrence outflow had decreased by more than 90% (Figure 1). In the year 2010 simulation results indicated that after losses of mirex to the food web (0.08×10^4 g), sediment burial (0.01×10^4 g) and river outflow (0.01×10^4 g), approximately 0.08×10^4g of mirex remained in the Lake Ontario ecosystem. This amount was equal to what was taken up by fisheries annually. Thus, we could assume, based upon model results, that after the year 2010 mirex would be eliminated from the Lake Ontario ecosystem.

This estimate is conservative, considering that there could be large variability in food web transport annually, varying lake levels will affect the amount of material exiting the Lake via the St. Lawrence River, and amounts of mirex initially lost through sediment burial may be reintroduced to the system either by storm surge scouring of deep sediments or by burrowing benthic invertebrates that rework sediments deeper than 6 cm. Thus, the best available but conservative estimate for persistence of a toxic chemical in Lake Ontario similar in characteristics to mirex, as described here, would be a minimum of 40 years.

Unlike nutrients, no long term records of organic and metal contaminants exist for Lake Ontario that can reliably be subjected to trend analysis. To assess lakewide response to remedial efforts at reducing contaminant loadings, indicator organisms have been used as surrogate measures of contamination and sediment cores have been employed to date the first appearance of some contaminants in the lake. As a consequence of significant loadings to Lake Ontario, body burdens of many contaminants in biota are the highest of all the Great Lakes. For example, based on analysis of dorsal fillets from 3 year old coho salmon (Oncorhyncus kisutch) from all the Great Lakes, levels of PCBs, DDT, mirex, photomirex, hexachlorobenzene and mercury were highest in those fish taken from Lake Ontario (DeVault and Weishaar 1982; Clark, et al. 1984). These high contaminant levels in fish have resulted in consumption advisories for Lake Ontario.

The longest record for contaminants in Lake Ontario biota is provided by the monitoring of herring gulls. Concentrations of all six major organochlorine residues in herring gull eggs from Lake Ontario colonies, however, have shown declines since 1974. As an example of changes, levels of DDE and PCBs have decreased 79% and 78% respectively, between 1974 and 1983 (International Joint Commission 1987). Trends in trace organic contaminants in lake trout (Salvelinus namaycush) generally parallel those of the herring gulls, although levels exhibit considerable year-to-year variation (Whittle and Fitzsimons 1983). Age 4+ year lake trout samples were utilized to describe temporal contaminant trends (Figure 2). PCB concentrations declined steadily from 1977 to a significantly lower level ($P<0.001$) in 1981. Whole fish PCB levels in age 4+ lake trout increased significantly (67.3%) from 3.67 ug/g in 1981 to 5.87 ug/g in 1982 and subsequently to 6.44 ug/g in 1983 samples. Similarly levels of DDT and mirex in 4+ lake trout all increased significantly in 1983 as compared to levels reported in preceding years. With the exception of the 1984 minimum value, annual mean mirex levels in Lake Trout have not changed significantly ($p<0.05$) from 1980 to 1985. This suggests a constant input or a recycling of mirex within the Lake Ontario ecosystem, with probably the latter being the case.

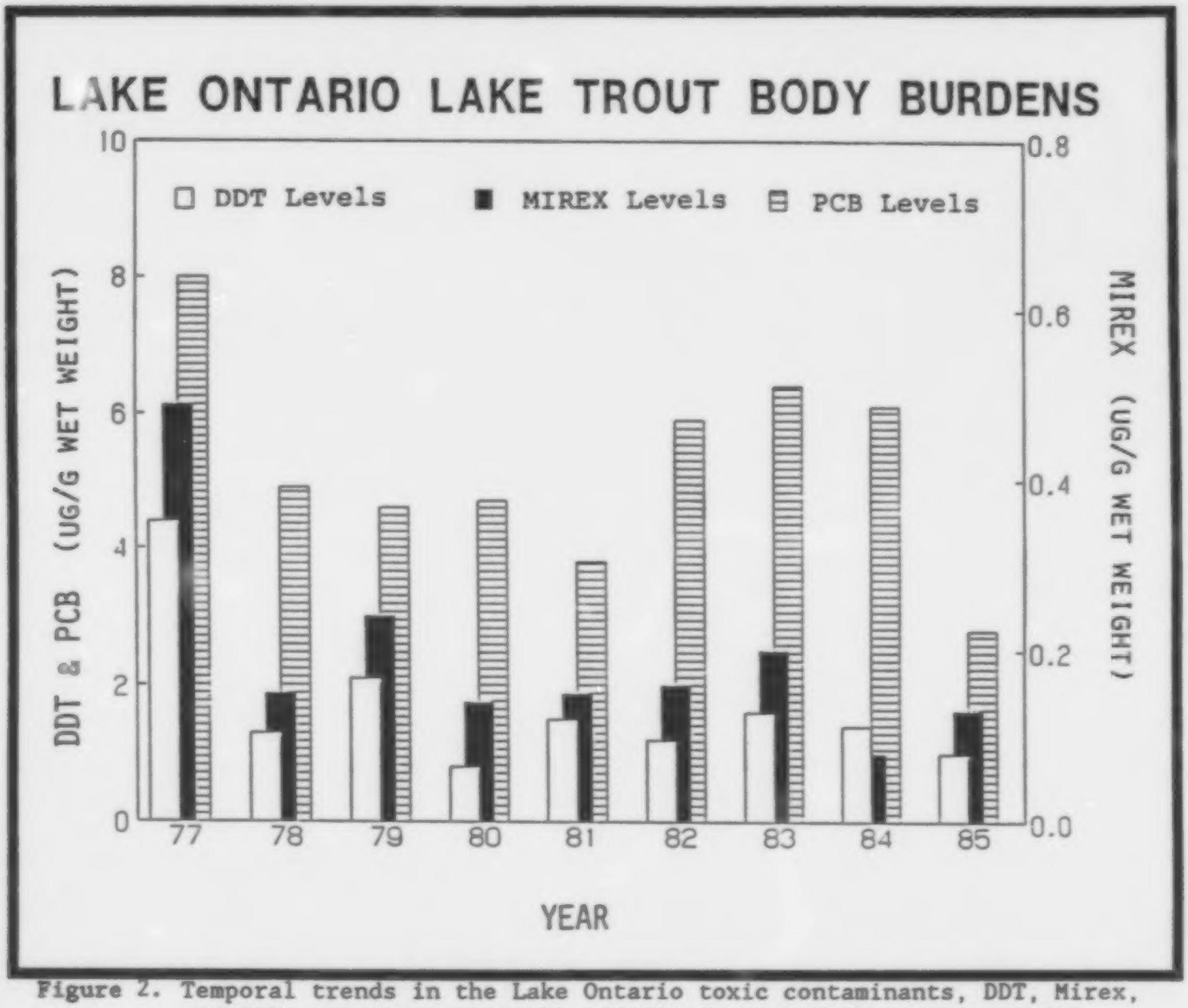

Figure 2. Temporal trends in the Lake Ontario toxic contaminants, DDT, Mirex, and PCBs, as measured in the flesh of age 4+ Lake Trout samples between 1977-1985. Data derived from the International Joint Commission (1987a).

Toxic contaminant levels (PCB) were also monitored in terrestrial mammals in close proximity to waters containing high toxic loads (Foley, et al. 1988). The PCB levels measured in wild mink were similar to those which caused reproductive problems in laboratory feeding studies on this species. In attempting to gain a better understanding on the source of contaminants to the mink, Foley, et al. (1988) examined contaminant relationships of this animal to those of fish. Significant correlations between fish and mustelids were observed, indicating a relationship between the accumulation of PCB and DDT in mustelids and levels of these chemicals in a potential food source.

It is apparent from this comparison of mustelids and their food source, fish, that bioaccumulation and biomagnification of toxic contaminants occurs in Lake Ontario (Figure 3). As is illustrated in Figure 3, this dynamic of bioaccumulation has been recorded for several different toxic materials and occurs in a number of different species that are all connected in the Lake Ontario food web. Mean bioconcentration factors for organochlorine compounds such as PCB or DDT are 10^5 within the aquatic food chain up through herring gulls, which represent the highest trophic level.

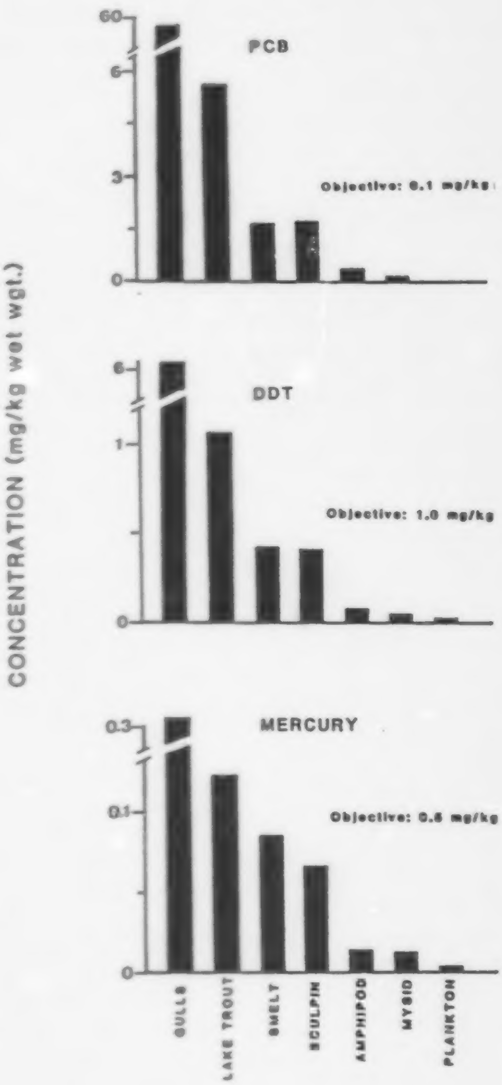

Figure 3. Illustration of the biomagnification of PCB, total DDT and mercury through the Lake Ontario food web. From the International Joint Commission (1987a).

TOXIC CONTAMINANTS AND HUMAN HEALTH

The Great Lakes Program of the State University of New York (SUNY) at Buffalo undertook to establish a bi-national project in 1988. This process did not arise in response to a charge from any organization, nor was it designed to report to any particular body other than governments and the public at large. The common thread of interest that united all who participated was the need to evaluate risks to human health associated with exposure to toxic chemicals in the Great Lakes ecosystem. SUNY sought to implement this process at the regional level in response to inadequate actions to address toxic chemicals in the Great Lakes, noted in a project BRIEFING BOOK (Flint and Vena 1989), in the EXECUTIVE SUMMARY of an International Working Conference (Flint 1989), and most recently, in the IJC's 1989 Biennial Report. The following indicates information that a number of scientific experts from many disciplines were able to agree upon regarding the risks to human health from exposure to toxic chemicals in the Great Lakes Basin Ecosystem.

Wildlife toxicologists studying plants and animals in the Great Lakes reached consensus on several points:

- similarities in response to toxic chemical exposure are observed at the cellular level in several species of animals, as well as humans;
- similarities in developmental events that occur from toxic chemical exposure during embryo formation are observed in at least seven different species ("a message for human health science"); and
- similarities in food web dynamics and contaminant biomagnification and effect are recorded in different wildlife systems - man is at the top of the food web and maybe only diversity of diet affords temporary protection.

These scientists strongly believed that if something can act as a cancer-causing agent in six or seven different species of animals, it would be short-sighted to say there is no possibility that the suspected substance can act as a teratogen in humans. By taking this line of reasoning, the wildlife toxicologists believed that we may be more able to draw inference from data bases on wildlife exposure to potential interpretation of human exposure events. They suggested for example, that the most critical populations for toxic chemical exposure in the Great Lakes would include the developing embryo, the fetus, and neonates, both in wildlife and in humans. For example, in fish, birds, and mammals other than humans, it has been observed that the developmental stages of species are more than 100 times more sensitive to toxic chemical exposure than adults of the same species.

Based upon present evidence, environmental toxicologists believed that the major route of human exposure to toxic chemicals in the Great Lakes Basin is through the dietary ingestion of fish, turtles, and birds. Their evidence includes:

1. the findings of lower birth weight and sub-clinical neurobehavioral effects in infants of mothers who consumed Lake Michigan fish;

2. similar neurobehavioral impairments in American infants born of mothers with high background exposures to PCBs;

3. neurobehavioral impairments in Taiwanese infants born to women with high-level exposures to PCBs;

4. similarity of neurobehavioral disfunctions in all these human studies, suggesting that halogenated aromatic hydrocarbon contaminants in Great Lakes fish might be responsible for the neurobehavioral effects; and

5. peri-natal exposure of primates and other animals to halogenated aromatic hydrocarbons has produced neurobehavioral changes, which provides indirect evidence in support of human findings.

A significant fact-finding aspect of this program conducted by the University at Buffalo was the International Working Conference held in October 1989. This Conference provided the forum for 66 participants to share differing scientific and societal opinions so that a common ground of understanding could be reached on the following questions:

- **ARE THERE THREATS TO HUMAN HEALTH FROM TOXIC CHEMICALS IN THE GREAT LAKES BASIN ECOSYSTEM?**
- **IF SO, WHAT ARE THEY AND HOW CAN THEY BE MITIGATED WITH RESPECT TO POLICY, EDUCATION, AND RESEARCH?**

Consensus on a Conference conclusion was reached by all participants which stated the following.

> "**PERSISTENT TOXIC CHEMICALS** (including some metals), **DUE TO THEIR NATURE** (ability to cross the placenta, to bioaccumulate, to occur as mixtures, showing long half-lives and toxic properties), **POSE THREATS TO THE HEALTH OF INDIVIDUALS WITHIN THE BASIN**".

Infants, mothers, the elderly, and consumers of large quantities of some fish or wildlife were thought by the experts to be more threatened than others. The exact and precise magnitude of that threat is uncertain, but that uncertainty should not be an impediment to actions aimed at reducing risk.

POSSIBLE SOLUTIONS

Ecological risk assessment is the scientific process of evaluating the risk that pollution poses to our environment. This process has traditionally been narrow in scope; focused on evaluating the effects of individual pollutants and discharges on a limited number of species to provide the data needed for regulation. Consequently, we lack the base of information and resources to assess the impact of system-level stresses we are now facing in the Great Lakes Ecosystem. In order to determine which ecological resources are at risk we need to understand how contaminants enter and move through the ecosystem and identify endpoints that indicate the condition of these systems. This involves determining the baseline characteristics that define a healthy ecosystem and that can be used as a standard against which to measure change.

Although significant progress has been made since the original signing of the 1972 Great Lakes Water Quality Agreement by the U.S. and Canada towards improving the state of Great Lakes resources, and in particular water quality, governments recognize that some of the problems facing the Great Lakes community now (e.g., hazards from toxic contamination) require something more than the means employed in the past to solve traditional pollution problems in these Lakes. Over the last three decades we have become conscious of the fact that the Great Lakes have deteriorated because of the input of toxic chemicals that have significantly impaired beneficial uses of these resources. The environmental legislation enacted during these years reflected our perception of pollution as a relatively discrete local problem. This "end-of-the-pipe" approach has successfully enhanced the quality of many local environments.

Despite these improvements, we now face another level of environmental deterioration far more ominous to our future than any end-of-the-pipe problem. This deterioration is progressing from continuing, persistent, and cumulative toxic pollution. Current end-of-the-pipe controls regulate concentrations, not total loadings, and therefore, they still allow increases in total discharges of persistent toxics as the total amount of industrial or municipal wastewater discharges rises. Addressing this new generation of environmental and public health problems will require a major shift in our overall approach to Great Lakes resource protection, and in our strategy for generating the knowledge necessary to create and implement protection programs.

For example, a refinement in our managerial approaches is needed that integrates a number of methodologies, often applied in isolation from one another, to provide good scientific, technical, and social evidence upon which to improve existing approval processes for discharge of toxic substances into Great Lakes waters within the context of the ecosystem approach. Traditional pollution control generally focuses upon meeting a set of ambient standards within the "mixing zone" at the point of discharge (Figure 4). These standards are usually set to ensure the viability of a designated use for water resources (e.g., drinkable, swimmable, fishable), but again target only the immediate mixing zone in the area of discharge. This traditional approach does not work toward an absolute reduction of total amount of pollutants discharged into the entire system, but rather only addresses relative levels of reduction (according to ambient levels in the discharge area). Consequently, even though local concerns for pollution protection may be met by following the defined standards, the absolute levels of pollution may be getting worse throughout the ecosystem because of the CUMULATIVE & PERSISTENT nature of toxic substances from a larger number of discharge sites (Figure 4).

The **MASS BALANCE APPROACH** will help in overcoming this shortfall in traditional pollution control and will also help to focus more attention on non-point sources of pollution, which are again not adequately controlled with traditional pollution control strategies. This is the major emphasis of the lakewide management strategy presently being formulated by the U.S. Environmental Protection Agency and Environment Canada.

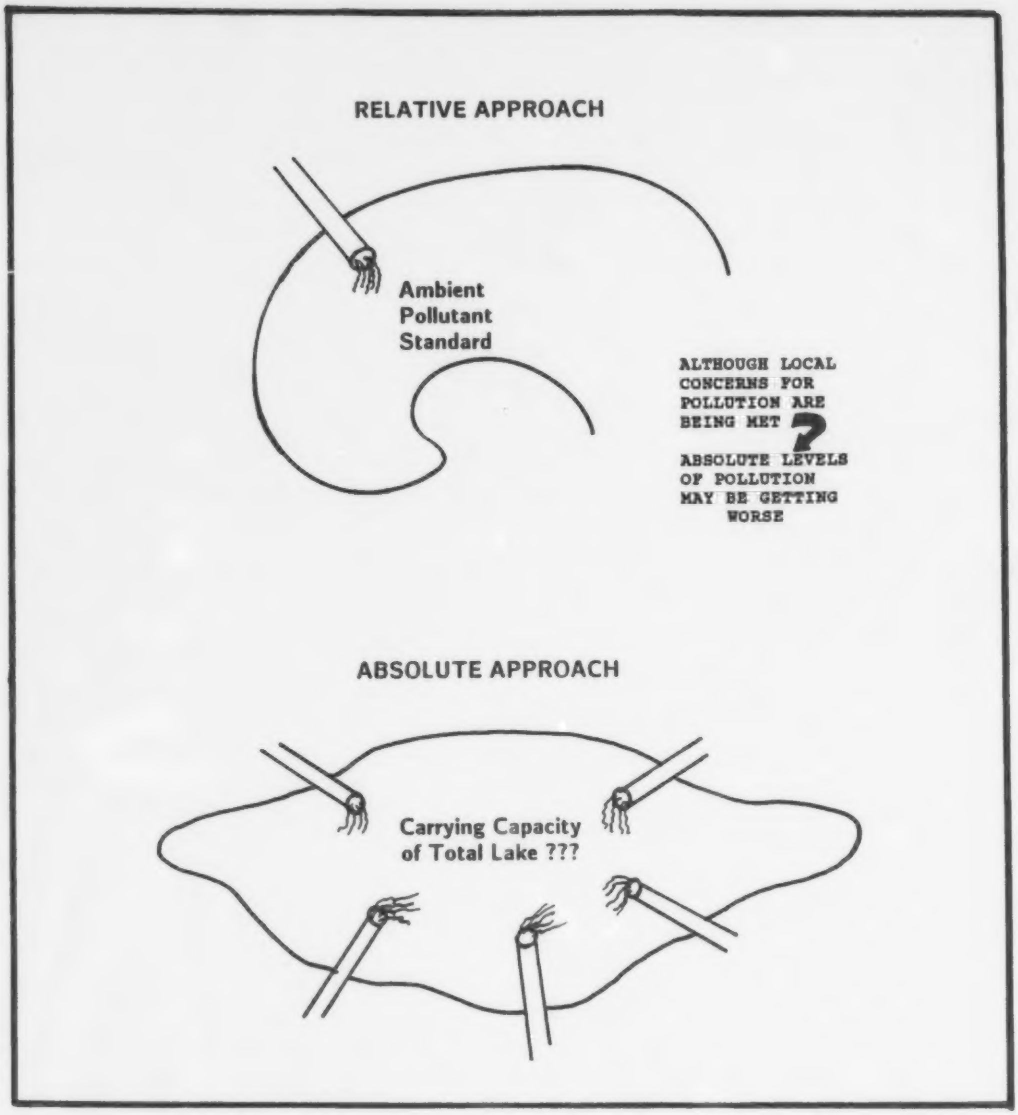
RELATIVE APPROACH
Ambient Pollutant Standard
ALTHOUGH LOCAL CONCERNS FOR POLLUTION ARE BEING MET
?
ABSOLUTE LEVELS OF POLLUTION MAY BE GETTING WORSE
ABSOLUTE APPROACH
Carrying Capacity of Total Lake ???

Figure 4. An example demonstrating how traditional pollution control focuses upon the relative approach to discharge reduction instead of the absolute approach.

Another means of overcoming the traditional limitations posed by the use of ambient standards, as described above, is to focus on the concept of **LOAD ALLOCATION** for the determination of discharge levels of toxic substances. This concept better connotes the general aim of environmental standards: i.e. to reduce the risk to the ecosystem by decreasing total loadings of pollutants. The concept of load allocation is a natural consequence of the mass balance idea mentioned above. Once a decision-maker has a clear picture of all the sources and fates of pollutants, and their projected long-term effects, informed decisions can be made as to how much of a pollutant can be allowed to enter into the ecosystem (load allocation).

The concepts of mass balance and load allocation are descriptive in nature. They describe where pollutants come from, where they go, and provide a technique for controlling the overall quantities entering or leaving the ecosystem. The prescriptive nature of this technique requires determining what the load allocation should be, or what level of reduction (considering long-term anticipated effects) is acceptable. Particular acceptable levels of pollution are determined in a number of ways, many of which present a set of additional problems. One approach is to base an ambient or effluent standard on some sort of technology. In recent years, however, the idea of best available technology (as defined in the "Clean Water Act") has not been meeting the needs for further reduction of pollutants. Another approach is quantitative risk assessment for carcinogens. Unfortunately this methodology ignores non-cancerous effects such as reproductive, neurobehavioral, or immunological effects. In addition considerable uncertainty exists using this approach because there is a lack of adequate data on the toxicity and exposure to plants, animals, and humans from potentially harmful substances.

A more appropriate approach to supplement the shortfalls from the descriptive nature of the mass balance and load allocations methodologies is to determine what is a healthy ecosystem and work backwards to determine the standards that would achieve that goal. Such a system of standard-setting involves the formulation of **ECOSYSTEM HEALTH CRITERIA**, which in turn encompasses many elements. The most important of these elements is a sound scientific base which provides the basis to determine what in fact is a "healthy" ecosystem. The idea of ecosystem health criteria (indicators of a healthy ecosystem) overcomes three concerns with regards to taking the traditional piecemeal approach to pollution reduction:

- ecosystemic: the criteria are considered on a basin-wide basis
- sustainable: the health criteria are viewed in a holistic and long-term perspective
- cross-media: to the extent that the health criteria focus on the sources and fate of pollutants, as opposed to media

At present, ecosystem health criteria may be difficult to formulate. There is a critical lack of ecotoxicological and epidemiological information for most toxic pollutants. What is needed, therefore, is a serious coordinated effort directed at developing biomonitoring and other such data-gathering methodologies. In addition, there has yet to be developed a ways and means for all sectors (including the different disciplinary sciences) to review, debate, and ultimately agree upon the interpretation of the data. A comprehensive strategy to overcome this shortfall is certainly needed to move decision-making onto a more sound plateau.

Once ecosystem health criteria have been formulated and total loading quantities developed (mass balance modeling), as illustrated in Figure 5, it is then possible to allocate to pollutant sources the relative proportionate share of the total amount approved for discharge. The most difficult task with respect to loading approvals, however, is the allocation of the total loading amounts to each respective source within the ecosystem. Again the mass balance approach can be used to determine how the discharge allotment should be allocated to each source of the pollutant(s).

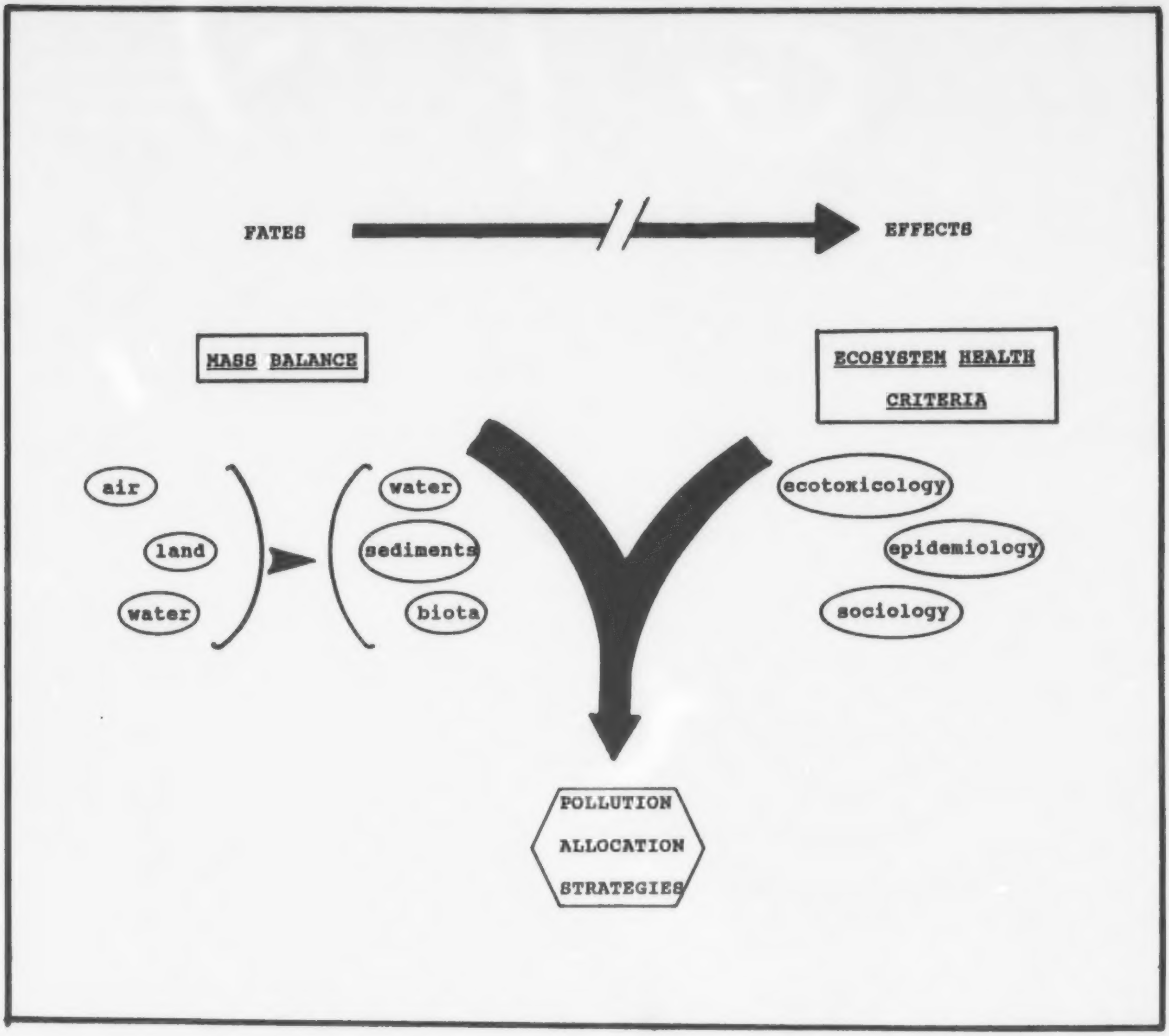
FATES
EFFECTS
MASS BALANCE
ECOSYSTEM HEALTH CRITERIA
air
land
water
water
sediments
biota
ecotoxicology
epidemiology
sociology
POLLUTION ALLOCATION STRATEGIES

Figure 5. Schematic demonstrating the integration between mass balance information and ecosystem health criteria assessment to determine the most protective pollution allocation strategies.

A total ecosystem approach demands an expanded monitoring and assessment system for the Great Lakes capable of establishing the chemical, physical, and biological effects of toxic substances. This expanded capability is essential to identify pollution trends, their attendant causes, and when linked with mass balance modeling, appropriate preventive or remedial measures designed around sound allocation strategies.

A NEW WAY OF DOING BUSINESS

The regulatory process alone, however, may be unable to address or resolve all identified problems. Economic activity must, sooner or later, be brought into harmony with the limits of the ecosystems we inhabit within the scope of sustainable development principles. Therefore, there is a need for **ALL GOVERNMENTS TO DEVELOP AND PROMOTE INCENTIVES THAT INDUCE CHANGES IN THE ECONOMIC STRUCTURE, TOWARDS A SYSTEM OF ECONOMY THAT PROMOTES AND ENHANCES HARMONY WITH THE ECOSYSTEM.**

Responsible jurisdictions need to _prevent_ the development of problems associated with toxic chemicals in the Great Lakes through pro-active policies, not just rely on remediation after the fact. We recognize that many preventive actions pertaining to persistent toxic chemicals can be taken without further research. In order to accomplish this task, however, there is a need for behavioral changes in governments and society. For example, ethical issues play only a minor role in modern decision making and are too often made subservient to legal issues. _We need to convert what is considered legal to what is considered ethical. We also need to convert what is considered permissible to what is considered moral._

Pragmatic environmental management involves maximizing exploitation while minimizing harm and uses contemporary pollution control strategies (_e.g._, best available technology) and environmental impact assessment as resource management tools. In attempting to minimize harm, traditional environmental protection considers the environmental component as an "add-on" to the normal realm of public and private developmental initiatives. Sustainable development attempts to _integrate_ and _build-in_ environmental considerations to such decision-making.

In our economy-centered culture, society has developed a faith in science and technology without reference to their uses. Society uses science and technology to advance competitiveness, efficiency, exploitation, industrial growth and domination as measures of success. Thus, there are no appropriate ethical principles of conduct to guide the behavior and choices of individuals, agencies, and corporations. For example, the U.S. Clean Water Act stresses as a manadate the "elimination of pollution from U.S. waters" and links this charge to the implementation of "best available technology". We are presently at a point of not having better available technology that is cost effecient to continue decreasing many of our pollutant discharge levels and the only way to move forward is to begin incorporating concepts of sustainable development, ecosystem approach, and ethics into our strategies for further improvement.

There is need to investigate an approach to Great Lakes decision-making which also incorporates environmental values and explicitly recognizes ethical guidance as an appropriate model for policy development and human functioning. The consideration of sustainability challenges us to examine the important links between human activities and biological systems. When the notion of sustainability permeates our economic and environmental decisions, and we begin asking ourselves what the environmental consequences (future generations) will be, then we will have an environmental (ecosystem) ethic in action. An ecosystem ethic is a comprehensive blueprint for action to protect the environment and its ability to meet the needs of society now and in the future. It provides a means of focusing the efforts of many different societal sectors towards a common goal and a standard by which to measure the success of those efforts. If a code of ethics is shared by all it can provide a common vocabulary, and a framework for policy making, cooperative action, and conflict resolution from a moral perspective.

The adoption of an environmental ethic and sense of respect should be encouraged and guided by jurisdictions responsible for protection of this ecosystem and its resources. It should also be recognized that the issues the Great Lakes region faces are not unique to the region. Rather, they are symptoms of a human system which tries to control, rather than live within, the environment surrounding it. A well-educated and motivated population, which understands that humans are a part of, and not separate from, the environment, is our best assurance that effective action will be taken to restore and protect New York's Great Lakes Basin Ecosystem.

CONCLUSIONS

More than 30% of the U.S. population is located in and around the Great Lake's watershed, occupying one sixth of the U.S. land area (Federal Reserve Bank of Chicago 1985) These large numbers of people make intensive, varied and often conflicting uses of coastal areas, uses which in many circumstances already have resulted in degraded environmental quality and have contributed to substantial reductions in natural resources, in contrast to historical records of pristine waters. Because of the enormous importance of the Great Lakes to society, and because of the stressed nature of many of them resulting from multiple and conflicting uses, it is not surprising that society has demanded that government direct its attention to protecting and, when necessary, to rehabilitating these valuable natural resources.

Toxics for example, can lead to human health problems such as changes in infant behavior, genetic damage, disorders of the reproductive system, and cancer. Toxic contamination has also been identified as the source of tumors in fish and damage to aquatic plants and animals. The relative lack of knowledge about the effects of toxic contamination can also have expensive consequences for industries subject to water quality regulation. Regulators faced with the need to exercise their environmental protection responsibilities without sufficient knowledge of the effects of toxic contamination are often forced to adopt a "worse case" scenario, which may in some instances result in over-regulation.

In summary, the body of persons involved in this work, representing a wide array of professional disciplines bearing on the question, is unanimous in its opinion that there is clear and abundant evidence of harm to the health of animal populations from persistent toxic chemicals in the Great Lakes Basin ecosystem. There is also direct evidence of harm to human populations, though it is much less complete. We cannot wait for science to measure the dimensions of the threat to health before we act. We know enough now to accelerate our efforts to reduce environmental contamination and to remediate severely polluted areas. Knowing more is only significant in terms of fine tuning how stringently we act.

The regulatory process has the ability to reduce potential threats to society now. There is a need, however, for **ALL JURISDICTIONS TO REAFFIRM AND**

MORE AGGRESSIVELY MOVE TOWARD ZERO DISCHARGE OF PERSISTENT TOXIC SUBSTANCES. Consistent with the Great Lakes Water Quality Agreement, it is further suggested that U.S. AND CANADIAN FEDERAL, STATE/PROVINCIAL, LOCAL AND TRIBAL GOVERNMENTS DEVELOP COMMON STANDARDS FOR WATER QUALITY, SEDIMENTS, AND FISH BODY BURDENS WITHIN THE BASIN, WHILE ENSURING FULL COMPLIANCE WITH EXISTING LAWS.

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APPROVALS - UPDATE AND TRANSITION

by

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GENERIC CONDITIONS

FOR

CERTIFICATES OF APPROVAL

APPROVAL BACKGROUND:

- WASTEWATER APPROVALS 1958
- AIR APPROVALS 1968
- WASTE APPROVALS 1970
- PRIMARILY DESCRIPTION OF FACILITIES WITH NO CONDITIONS - NOT A BASIS FOR ENFORCEMENT

EVOLUTION:

- PUBLIC ATTITUDE CHANGED LATE '70'S EARLY '80'S
- DIFFICULT ABATEMENT PROBLEMS REMAINED
- RESISTANCE TO IMPLEMENT COSTLY MEASURES
- EMPHASIS FROM ABATEMENT TO ENFORCEMENT

ENFORCEMENT:

- POLITICAL WILL TO ENFORCE
- FORMATION OF (I00+) BRANCH - 1985
- NEED FOR CONDITIONS TO BE LEGALLY SOUND, CONSISTENT, PRECISE
- FAIRNESS
- EXPEDITIOUS (VOLUME INCREASE)

STANDARDIZATION:

- APPROVAL PROCESS
- LAWYER ATTACHED TO APPROVALS BRANCH
- WASTEWATER (SN. 24) FIRST
- LAST INTERNAL CIRCULATION OF DRAFT
- FINAL DRAFT OUT FOR COMMENT - AUGUST 1990

GENERIC CONDITIONS OVERVIEW

SECTION 1 - GENERAL (FINE PRINT)

- DEFINITIONS
- LEGAL BASIS
- SCOPE
- INTERPRETATION
- ENTRY AND INSPECTION
- CHANGE OF OWNER
- FREEDOM OF INFORMATION

SECTION 2 - OPERATION & MAINTENANCE

- OPERATIONS MANUAL
- BYPASSES

SECTION 3 - PERFORMANCE

- EFFLUENT OBJECTIVES
- EFFLUENT REQUIREMENTS

SECTION 4 - MONITORING AND RECORDING

- SAMPLING
- PARAMETERS
- FLOW MEASUREMENT
- RECEIVING WATER MONITORING
- RECORD RETENTION

SECTION 5 - REPORTING

- ROUTINE
- ANNUAL
- CERTIFICATION
- ABNORMAL EVENTS

SECTION 6 - FINANCIAL ASSURANCE

- PART X-A EPA
- FORM
- CONDITION OF USE AND DEFAULT

SECTION 7 - MISCELLANEOUS

- REGISTRATION ON TITLE
- INSURANCE

REASONS FOR CONDITIONS

- GENERIC

USE OF GENERIC CONDITIONS

- GUIDE FOR APPLICANTS
- GUIDE FOR STAFF
- NOT INTENDED TO REPLACE BPJ
- CONTINUALLY REVISED

IMPLICATIONS OF MISA, CAP, OWAS

- PRIMARY LEGAL INSTRUMENT
- MUCH OF GENERIC CONDITIONS WILL BE WRITTEN IN REGULATIONS
- SPECIFIED TERM
- INITIAL REQUIREMENT FOR 1 APPLICATION TO COVER ALL CURRENT ACTIVITIES
- GREATER COVERAGE (PARAMETERS, SAMPLING, ETC.)

FUTURE

- AIR NEXT (SECTION 8 - REG. 308)
- WASTE TO FOLLOW
- TRENDS TO EVEN GREATER ENVIRONMENTAL DEMANDS THROUGH CERTIFICATES OF APPROVAL AND CONDITIONS
- STEPPED UP ENFORCEMENT

PROCEEDINGS NOTATIONS AND REFERENCES